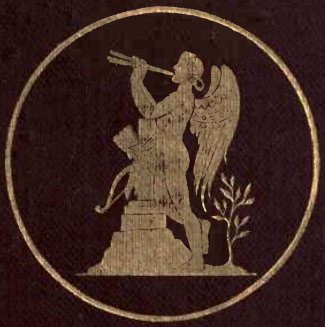

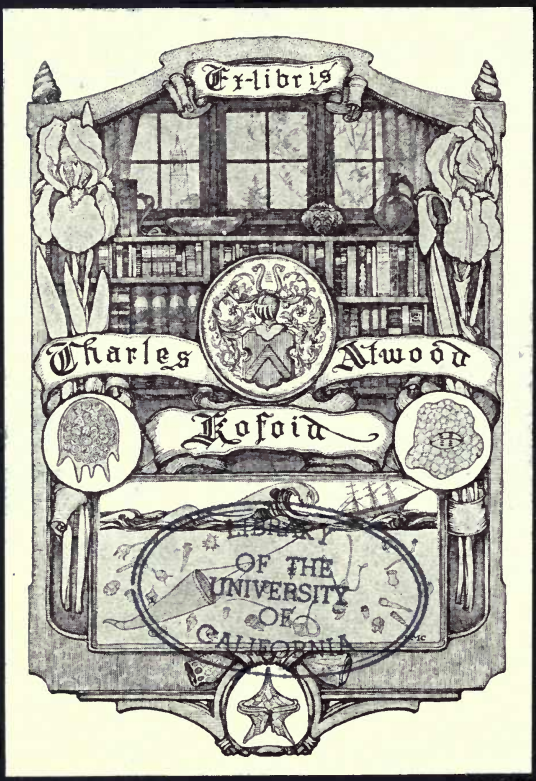
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GEMS

GEMS

NOTES AND EXTRACTS

BY

AUGUSTO CASTELLANI.

TRANSLATED FROM THE ITALIAN

BY

MRS. JOHN BROGDEN.

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CONTENTS.

INTRODUCTION.

GENERAL OBSERVATIONS.

MINERALS consist of all those substances which have neither animal nor vegetable life, and are therefore devoid of sensation, existing merely by the power of aggregation or chemical affinity.

The science which treats of minerals is called Mineralogy, and is divided into two distinct branches, viz., that which preserves the name, and treats simply of minerals with regard to their component elements, and Geology, which regards minerals pure or mixed, as they exist in nature and in relation to the soil.

Mineralogy describes the individual quality of the various mineralogical species; geology treats only of minerals as constituent parts of the earth.

Those minerals which are used ornamentally and are prized for their rarity are called *Gems*.

In mineralogy, as in other departments of natural history, minerals are united in groups, forming great classes, which are divided into genera, species, and varieties.

We are indebted to Theophrastus, philosopher of

Lesbos, for the most ancient treatise on stones. The mineralogical part of the Natural History by Caius Pliny includes a list of observations, many of which are still useful and acknowledged in the science. But, mineralogy has only taken the name and position of a distinct and separate science in modern times.

Bauer, the German (known by the name of Agricola, which he assumed in Italy, where he studied with the learned men who rendered it at that time the home of arts and sciences), wrote a work about the middle of the sixteenth century, 'De natura fossilium,' under which denomination minerals were then comprehended, and he was the first person who distributed them into distinct classes.

In Italy, the works of Andrea Cesalpino, of Camillo Leonardo, of Abramo Portaleone, of Giovan Battista Porta, and of Giovanni Serapione were already known.

Linnæus, who found the system of Agricola still in existence, wished to adopt a new classification for minerals, and was the first to introduce important observations on crystalline forms.

In 1758, Cronstedt, a Swede, discovered the elementary components of metals, and Werner, the Saxon, in 1774, gave some rules for determining mineral species in an empirical manner, and was able to define their character with great precision.

After him, the celebrated Abate Haüy, having discovered the laws which regulate the symmetry of crystals, shed great light on that science, which he thus founded on a more certain basis.

Chemical discoveries very much assisted the right classification of minerals, introducing in the science a new law, founded on analysis, which helped to confirm or slightly modify that which had been already established as to crystalline forms. Berzelius, Weiss, Becquerell, Ebelmen, Brewster, Mitscherlich, Brocchi, Spada-Medici, Pouzi, and a number of learned men of every other nation contributed to the advancement of the science.

Now, the learned, generally speaking, divide minerals into three classes: the first contains combustible minerals; the second, metals; the third, lithoids or stones. These three classes are subdivided, as we have already remarked, into genera, species, and varieties.

To the first class belongs the genus of carbonates, which is divided into four species, the first of which is carbon, properly so called, and of which one of the varieties is the cubic carbon, otherwise the diamond.

The third class distributes stones into twenty-four different genera, which are subdivided into many more species and varieties. For the sake of brevity we shall refrain from giving the denomination of each of these twenty-four genera, or orders, as they are called by others.

It is sufficient for us to know that amongst these orders are the alumina, the silicates, and the fluorites.

To the alumina belongs the species of corundum, of which the ruby, the sapphire, and, in short, all so-called oriental gems are varieties. Amongst the silicates is pure silex or quartz, from which is derived

the varieties of amethyst, rock crystal, plasma, agate, jaspers, obsedian, and opal; amongst the fluorites is the topaz; amongst the aluminous silicates are the species of garnet, emerald, felspar, and porphyry.

Gems are found naturally under two distinct modes of composition. Some have the atoms arranged evidently according to a fixed law, and are called "crystalline gems," crystallized gems and crystals. Others have very minute particles or molecules simply collected together, without constant regularity of form, and are called amorphous gems, from the Greek α, "without," μορφή, "form;" all the gems that solidify, after having been in a fluid state, belong to this class: when they are found under condensed gelatinous forms like opals they are called *porodine;* when they appear to have been condensed by ignition into vitrifications they are called "jaline," *i.e.*, vitreous crystal; this in mineralogy denotes a solid body, which presents naturally, and without the assistance of art, a many-sided figure, more or less regular, which varies almost infinitely. However, it must be remarked that these can be divided into six very distinct groups or systems, as follow:—

1st system, cubic.
2nd ,, square prismatic.
3rd ,, straight rhomboidal.
4th ,, oblique rhomboidal.
5th ,, oblique prismatic.
6th ,, rhombohedric.

The natural characteristics of gems are:

1st. The properties derived from the nature of the substance itself; namely, hardness and specific gravity.

2nd. Those phenomena which are produced more immediately by some external influence; as light, electricity, and heat.

HARDNESS.

In gems, hardness denotes not only tenacity, but also the greater or less resistance which they oppose to being cut, scratched, or polished by others; thus, while the diamond from its small tenacity is easily broken, and does not give out sparks under the action of the steel, it is the hardest amongst gems, because it cuts all other bodies, without being itself marked by them.

The hardness of gems, considered as the attraction of cohesion—that is, in the power they have of resisting the blows they receive to break and divide them mechanically—differs considerably in the same species, according to the direction of the cutting, the surface of the stone on which the trial is made, and its more or less perfect quality.

Hardness, and not cohesion, is the basis on which general experience rests for determining to what species a given gem belongs. For such a purpose, practitioners adopt the file; but the mineralogist rubs the stone which is to be tried against another, beginning with the hardest gem, which is the diamond,

and thus forms, by comparison, a graduated table, which is useful afterwards for new trials and experiments.*

In many crystals, perpendicular planes at right angles exist, and it appears that between these planes the cohesion is so slight that they can be separated with greater facility there than in any other place. This particular property is called "cleavage." In some gems it is very easy to ascertain the point of cleavage, but in others it is found with difficulty.

Many gems, as, for example, rock-crystal and emerald, will only break into irregular fragments.

SPECIFIC GRAVITY.

In order to determine the specific gravity of different bodies, distilled water is chosen as a means of comparison.

If it be a gem which weighs 17 carats in the air, and in the water but 12, there will be :

Weighed in the air ..	..	17 carats,
Weighed in the water	..	12 ,,
Difference	..	5

Now, dividing the weight of the gem 17 by the difference 5, the quotient will be—17 : 5 = 3·4, which

* Mohs has made a graduated table as follows :—1. White talc. 2. Sal gemma. 3. Calcareous spar. 4. Fluoric spar. 5. Apatite. 6. Adularia. 7. Rock crystal. 8. Topaz. 9. Corundum. 10. Diamond.

represents the specific gravity of the gem which has been put to the proof.

It is often very useful to know the specific gravity of gems, as a means of determining their quality, and to prevent the danger of their being changed for others, similar in appearance but very different in value; as, for instance, the diamond and the jargoon.

In the case of cut and polished gems it is therefore of great use in ascertaining the class to which they belong, without the possibility of injuring them by the otherwise necessary operation of filing.

The comparison of the specific weight of gems was, according to Emmanuel, known to, and practised by, the ancients, and certainly in the Indies, for many centuries, in order to ascertain the quality of a precious stone.

BRIGHTNESS, COLOUR, AND TRANSPARENCY.

Gems acquire more or less brightness, lively, varied colouring, and transparency, in proportion to their single or double refraction, and to the polarization of light.

The brightness of gems may be distinguished as follows:

I. Adamantine brightness; that which gives out the splendour peculiar to the diamond.

II. Vitreous brightness; that which resembles glass.

III. Resinous brightness; that which shines as if the surface had been rubbed with oil.

IV. Pearly brightness; that which resembles the particular light of a pearl.

V. Silky brightness; that which gives the appearance of silk-stuff.

The value of a gem depends principally on the beauty of its colour. The colouring material is generally composed of metallic oxides.

The wonderful variety of colours in the gems, which more than all others resemble those of the solar spectrum, gave rise to the diversity of names which are often given to the same substance. The red corundum is the oriental ruby; the blue corundum is the oriental sapphire; the yellow corundum is the oriental topaz. The bluish-green emerald is now called beryl. Quartz has many names; and more or less value in its different colours.

There are crystals which not only have a varied gradation of the same colour, but also present three distinct colours.

I possess a quartz in which the central disc is red, surrounded by a green zone, ending in a white band. Corundums have been seen in which shone red, blue and yellow; and we sometimes see the tormaline variously coloured, watered, and marked with strange figures.

In some gems the colour differs according to the reflection or transmission of light. The opal with reflected light is prismatic, and with transmitted light it is whitish. The tormaline with reflected light is red, blue, or some other equally bright colour, but with transmitted light it is olive.

Many crystals present beautiful changes of light, when this is reflected in certain given directions, as in the Labradors, the moon-stone, and the Asteria.

Minute crevices cause the iridescence, as in the stone called Iris.

Many gems are more or less transparent; that is, they possess in a greater or less degree the power of transmitting light; and, according to these degrees, they have different denominations. That stone is called "transparent" which, when placed before an object, does not impede its view.

When the stone allows an object to be seen indistinctly through it, it is called "semi-transparent," and "translucent" when it allows the light to pass, but hinders the view of objects.

ELECTRICITY.

Electricity is produced in gems by heat, friction, or violence. In some gems it is caused by warming them at the fire, and then they are said to possess *pyrelectricism.* Electricity is produced by friction in the topaz, the amethyst, all quartz, the diamond, the garnet and emerald. Some crystals become electrical by percussion, as, for instance, the Iceland spar.

Some stones conduct, others reject electricity, which in those cases is either positive or negative.

The power of retaining electricity when produced is very variable in stones, and the time which elapses

before they lose it forms a valuable mark of distinction amongst them.

The Indians have for a long time been aware of this property peculiar to gems.

The celebrated Haüy speaks of it at great length, while describing many instruments used by him to certify the phenomenon.

FUSION AND SOLUTION.

The facility or difficulty experienced in melting or dissolving a gem serves to indicate the elements of which it is composed.

The diamond alone will not dissolve, although it is combustible.

All the corundums can be dissolved by means of borax, but with great difficulty; the emerald, the jargoon, and the spinel more easily.

Caloric produces very different effects on other gems; some change colour, others swell and crackle, and many others burn—are changed into vitreous globules, into a kind of cement, into a powder; and in some others phosphorescence is produced.

Many other precious stones, besides the diamond, are incapable of injury by acids; amongst these are the corundum and the spinel.

Not a few change colour in acids, as, for example, the German agate.

2. HISTORY AND VALUE OF GEMS.

From the most remote antiquity, and previous to every historical tradition, men anxiously sought for gems, and it pleased even the most rude and savage people to use them as ornaments and signs of civil, military, or religious dignity.

Of this we are certain from the discoveries made in the most ancient tombs of Asiatic, Tyrrhenian, and Egyptian peoples, where gems were found, differing in quality, but almost all cut and wrought in the same manner. It appears that sapphires, emeralds, rubies, pearls, as well as jargoons, garnets, and agates were the gems most anciently known and used.

Before these, we find ornaments were used, of amber, glass, and enamel, together with bronze, gold, and silver; whence we conclude that, although nature supplied man with very hard stones, which required no labour but that used in discovering and digging them out, he nevertheless applied himself first to the manufacture of glass, amber, bronze, silver, and gold before using gems, perhaps on account of the difficulty of giving these a form suitable for armlets, necklaces, buckles, diadems, and rings.

It is also remarkable that these ornaments—of amber, as well as of glass, stone, silver, and gold—have been found from the first, wrought in the same fashion in the tombs of Tyrrhenia, Etruria, Egypt, Assyria, and Mexico. Whence in all parts of the world it has been

found, according to the most recent discoveries and studies, that amber, bronze, glass, silver, gold and enamel have been always used first; afterwards oxides and agates, in their natural state, but soon after engraved; and lastly gems, at first merely polished in their primitive forms, but finally engraved and in relief.

The form of these ornaments and jewels was especially similar in that primitive period, as much in Egypt, Phœnicia, and Assyria, as in Italy, Germany, and America. Amber was found in a variety of forms, because more easily fashioned; glass was always in perforated globules, which, when threaded, formed necklets or bracelets; bronze, silver, and gold were found in forms differing according as the ductility of the metal allowed fine and finished work. Agates, like glass, were pierced as beads, or made into "margherite," flat, circular, oval, rhomboidal, or square. They were afterwards found engraved as cylinders and scarabæi, but also pierced: finally, gems were obtained in their natural crystalline form, but polished on the outer facets, to give them transparency and brightness, after which they were with much labour pierced, and at last engraved.

With regard to gems, as to many other things, the ancients had uncertain, if not altogether false, notions, almost always mixed with foolish superstitions. Pliny and Theophrastus asserted in their writings that, in order to preserve health, it was useful to wear certain gems.

Every one knows how universal was the use of amu-

lets, which were generally gems to which secret or supernatural virtue was attributed, as that of giving beauty, youth, honour, power, and fortune.

The twelve stones, which in the breastplate of the high priest of the Hebrews indicated the twelve tribes of Israel, are the same as those which, amongst the Romans, signified the twelve months of the year and the signs of the zodiac.

They are—

1 Jacinth.	Dan.	Aquarius.	January.
2 Amethyst.	Gad.	Pisces.	February.
3 Jasper.	Benjamin.	Aries.	March.
4 Sapphire.	Issachar.	Taurus.	April.
5 Agate.	Naphtali.	Gemini.	May.
6 Emerald.	Levi.	Cancer.	June.
7 Onyx.	Zabulon.	Leo.	July.
8 Carnelian.	Reuben.	Virgo.	August.
9 Chrysolite.	Asher.	Libra.	September.
10 Beryl.	Joseph.	Scorpio.	October.
11 Topaz.	Simeon.	Sagittarius.	November.
12 Ruby.	Judah.	Capricornus.	December.

From an ancient Hebrew tradition we learn that when the high priest, on days of humiliation, asked the Most High to forgive the Israelites their sins, the precious stones of the breastplate cast an extraordinary lustre if the Lord graciously granted pardon, but became dull when his wrath was great towards his people.*

* Emmanuel, p. 28.

The Indians believe that a diamond taken with them in their long journeys is a certain earnest of safe return to the bosom of their families.*

In the East, the ruby is a stone of good augury, provided it is never shown to friends; it presages evil when it has a blackish spot.†

The same stone is given by the Chinese in token of sincere friendship.‡

Even in the present day the Persians believe that wearing the spinel causes joy and prevents evil dreams.§

Not a few people, even in Europe, think it very unlucky to receive the gift of an opal or to possess a sapphire.

One of the principal deities of the Peruvians—Esmeralda—had a niche formed of an enormous emerald.‖

Now in speaking of the value of gems we must mention a term known to all, and commonly used to distinguish broadly the most precious stones—the term Oriental gems.

In fact, the gems discovered in the East generally excel in beauty those found in the West.

But the qualities by which precious stones are distinguished from each other, and which in a greater degree prevail in the Oriental, are, as we have already stated,

* Feuchtwanger, p. 149. † Ibid. ‡ Ibid.
§ Ibid. ‖ Ibid.

1. Hardness.
2. Colour.
3. Clearness.
4. Specific gravity.
5. Chemical composition.
6. Crystalline form.
7. Rarity.

Therefore, according as these qualities, either all or almost all, are united in good proportions in the same gem, the higher is its value and the more it is prized amongst precious stones and feminine ornaments.

Whence, in giving a list of precious stones according to the value at present attributed to them, the above-mentioned qualities must be taken into account, and allowance made for the different value caused by diversity of size, greater or lesser transparency, and so on.

Thus, considering them as equal in quality, they may be ranked as follows:

1. Diamond.
2. Ruby.
3. Sapphire.
4. Emerald.
5. Pearl.
6. Opal.
7. Turquoise.
8. Garnet.
9. Beryl.
10. Jacinth.
11. Amethyst.
12. Jargoon.
13. Aquamarine.
14. Peridote.
15. Chrysolite.
16. Tormaline.
17. Rock crystal.
18. Agate.

Nevertheless, this is not the order in which our subject shall be treated, as there are many gems which can by no means with certainty be declared superior or inferior to others, because the supply of, and

demand for them varying, cause also a change in the value at different times attributed to them. We shall, therefore, following the example of many other writers, adopt the alphabetical order* as the most simple, convenient, and useful to those who wish to study this subject, although perhaps it is the least scientific in a mineralogical point of view. But we wish it to be understood that this work is not a strictly scientific treatise so much as a collection of useful and curious notes about all sorts of precious stones.

* This order cannot be observed in the translation, the initial letters of some gems being different in English.

I.

ADULARIA.

This stone is so called from *Adula*, the Latin name of Mount St. Gothard, as the best kind is obtained there, and particularly from that part called the "Monte della Stella."

Adularia belongs to the felspars, of which it is the purest kind. Its crystals have one of the facets deeply indented in the direction of the greater diagonal. Their primitive *nodus* is an oblique prism with rhomboidal sides, whose base is an oblique-angled parallelogram; the secondary forms present an oblique prism with four facets, a large rectangular prism, a tablet with six facets, and a rectangular prism with six facets.

Masses of rough adularia are found in which there frequently exist double crystals, and yet in this state of perfect union they have different degrees of hardness. Some also are opaque, others translucent or clear. This union of massed crystals causes the iridescence which often distinguishes those found in Italy, France, Germany, Norway, America, and the Isle of Ceylon.

That which comes from the Monte Stella is transparent, and has whitish reflections tinted with green and blue; some pieces shine with pearly light. Others

are of an iridescent green colour which resembles the eye of a fish; which often, in very thin lamina, becomes by reflection a pale rose colour.

This gem is remarkable for its brightness, which may compare equally with that of pearl and glass.

It is very easily worked, having three cleavages, and has double refraction.

Its cleavage is perfectly concave.

Being altogether destitute of electricity, it does not act on the magnetic needle.

When exposed to the action of the blow-pipe it melts into a transparent white glass.

Its specific weight is 2·5. The heat, 0·1861.

The analysis of adularia gives

Alumina	20
Silex	64
Potash	14
Lime	2

Although adularia scratches rock crystal, it is less hard than quartz. It is very difficult to specify its precise hardness, as the same piece contains portions which, being iridescent, are naturally soft; others of a milky whiteness, which are harder, and, lastly, others which surpass the rock crystal in resistance.

This substance, which has so many peculiarities, and is so specially prized for the pearl-white reflections which seem to move about inside the stone when it is turned, frequently owes more to the art of the lapidary for its admirable effects of light than to its natural

beauty. In commerce it has a strange multiplicity of names; now it is adularia, again it is lunaria or moon-stone, sun-stone, girasol, fish's eye, water opal, or opal of Ceylon, according to the colours reflected.

From Siberia we have a special quality which is of a yellow colour, sprinkled over all the surface with an innumerable quantity of small golden spots, produced by very small crevices in the lamina. The most beautiful, cut invariably into smooth beads, have reflections in form of a star, diverging from the centre, but are very rare. It is wrong to confuse this species of adularia with the Oriental aventurino, because, although it may have the same appearance, it has not similar hardness.

The adularia from Ceylon is generally in larger pieces than that from St. Gothard, but it is not so bright.

The brilliancy and slightly bluish whiteness of the moon-stone (lunaria) of Monte Stella are indescribable; however, its value is diminished by certain oblique lines which cross it internally.

It does not appear that the ancients used this felspar, nor do I believe that it can be engraved. Caire, nevertheless, asserts that Pini had a head of Achilles engraved on a moon-stone by Grassi, and that it came out with extraordinary effects. He believes, however, that the ancient names of *astrios*, *lapis specularis*, and *selenites*, applied to this stone.

II.

AQUAMARINA.

This stone is so named from its colour, which so much resembles sea-water.

Like other gems, it is divided into Oriental and Western. Amongst those which, on account of their hardness, are called "Oriental," the most hard is merely a light blue corundum with a slight tint of green and yellow. It is easily known by its specific gravity, which is always above 4. This gem is very scarce, and it would have all the value of other corundums but for the colour which is common to a great number of other stones possessing little value. The others are found in the Island of Ceylon, and from it they take their name. They are of a deeper greenish-blue colour, which renders them somewhat different from the Western stones. Their specific weight varies from 3·549 to 3·908, and it is thought that their hardness nearly equals that of the Brazilian chrysolite. They resist the wheel more than the others, and their brightness exceeds that of the Western gems. These are very transparent, and take a beautiful polish notwithstanding their inferior hardness, which is less than that of the topaz. The specific weight is from 2·70 to 2·77. They possess double refraction, but in a weak degree. The cleavage is brilliant and wavy, sometimes scaly. Their primitive form is an elongated hexagonal prism. They melt when exposed to fire and

lose their colour. They are found in Daouria, in the Uralian mountains, in Siberia, in the Altai mountains, and in America. When analysed they yield

Silex	68
Alumina	15
Glucine	14
Lime	2
Iron	1

Those from Brazil are at present most prized because they are most beautiful.

The aquamarina of Saxony is a variety of quartz very little valued, and in that country it takes its name from the different stones whose colour it resembles; thus, the bluish is called aquamarina; the yellow, topaz; and the olive, chrysolite. Great crystallizations of Western aquamarinas are found. That which was exhibited in London in the year 1855 was very beautiful. Caire possessed one which weighed five hundred and forty carats.

Fine and beautiful aquamarinas are worth from four to five hundred lire * the ounce; those which are beautiful, but small, are valued at but twenty-five.

The ancients used the aquamarina in its natural state, and also engraved, and they tell us of several celebrated intagli on that stone. They knew it under the generic name of aquamarina, and perhaps they often confused it with the beryllus, of which Pliny says, "It has the same nature as the emerald, and is of a green colour."

* A lira is about equal to $8\frac{3}{4}d.$

III.

AGATE.

So called from the Latin name, *Achates* (Ἀχάτης), of the Sicilian river now called Drillo, on whose shores this substance is found. This term generally indicates a great variety of semi-transparent quartzes. Agates are found in almost every part of the earth. Some are found in the East, some in the West, and the difference of their constituent parts makes the specific weight vary from 2·5891 to 2·6901.

The agate, properly so called, like that of Sicily, is naturally translucent; less transparent than crystalline quartz, but yet less opaque than jasper: it is too hard to be scratched even by rock-crystal; it takes a very good polish; it is never found in regular forms, but always either in nodules, in stalactites, or in irregular masses. Nevertheless, the agate called chalcedony frequently crystallizes in rhomboids. The Sicilian agate is often of a pale or grey colour, veined in a variety of forms; sometimes it is spread in reddish-violet spots.

The "fasciatella" agate is like a sample of many agates united in a single piece, and disposed in bands close to each other like ribbons or belts. The bands are sometimes in right lines; others are curved, and then of a circular form arranged round a common centre.

Eye agates consist of those parts of the stone in which

the cutting discovers circular bands of very small diameter, arranged with regularity round one circular spot. These circles are frequently so perfect that they appear to be traced by the compass, and consist of two or three, seldom of a greater number. The first round is white; the second, black, green, red, blue or yellow; the most rare are those whose circles are at equal distance from the centre.

The tree, or *dendrifica*, agate, from the Greek δένδρον, *a tree*, is that in which the material being formed in successive strata, it has allowed access between the strata to metallic solutions, which, under the pressure of the air, and by the solidification of crystals, remain there in a metallic state after evaporation.

It is called *tree agate* when the enclosed pieces represent trees, and *muscosa* when the pattern resembles flies: very seldom are these two phenomena represented together on one piece. Agates are found containing impressions of different plants, and of what appear groups of herbs, bushes of box tree, and ramifications of various sorts. The *tree agate* of the East is superior to that of Europe; the beautiful polish which it takes, and its natural brightness, contrast in a marvellous manner with the dark-coloured ramifications. When the colour of the plants is red, the agates are more valued, because more rare.

Figured agates are greatly admired for the form of their spots. Towards the close of the last century they were much in demand, and brought a high price, whence they were eagerly sought for, and perhaps

deservedly, on account of their singularity; for they were discovered with such combinations of design as would appear impossible without a hand and mind to have executed them purposely.

In fact, the figures formed by metallic oxides inside the agate do not exist in a natural state exactly as they appear when the stone is cut. The skilful artist often finds it necessary to cut away some lines, marks, or spots which would otherwise deprive the design of regularity; whence it may be said that, in this respect, the lapidary resembles to a small extent the sculptor who carves the statue from the block, cutting away the superfluous parts. No little study and cleverness are requisite in deciding on the best treatment of the spots existing in the interior of the stone, and in executing the intagli so that they produce the best effect. Camello Leonardo da Pesaro states that he has seen a figured agate in which were distinctly represented seven trees on one even ground. Boëce de Boot declares that he possessed one in which a mitred bishop was designed; on another Poujet saw a Turk; Caire had one on which was delineated a cock in an attitude of defiance.

Crystallized agates are those whose mass is divided by numerous fissures into divisions, which are either square, triangular, or radiating. They are vitrified, translucent quartz.

The agate *xyloidina*, so called from the Greek word ξύλον, *wood*, is that kind generally designated agatized wood.

The Oriental agate is almost always transparent, and

of a vitreous light; its material is homogeneous, and resists acids, being harder than the Western agates.

Agates of all sorts have the property of acquiring stains of every colour by artificial means; black is given by boiling the stone in honey, in olive oil, or in water and sugar, and afterwards in sulphuric acid, which carbonizes the oil and sugar absorbed by the stone. To give a red colour, protosulphate of iron is added to the sulphuric acid, by which means the iron remains oxidized. The bluish colour is obtained by using yellow prussiate of potassium, together with protoxide of iron.

The Oriental as well as the Western agate, when much variegated, is used in works of art. We have beautiful fragments of cups, both smooth and carved, in this substance, which bear comparison with the most classical remains of the art, wealth, and magnificence of antiquity.

IV.

ALABASTRITE AND ALABASTER.

A WHITE chalk of very close substance is called alabastrite.

It is a species of sulphate of lime; specific gravity from 2·7 to 2·8; and in scientific language is called chalky alabaster: it is very different from true alabaster, for which it is often mistaken. Much softer and more transparent than white marble, alabastrite excels it in whiteness, and its substance is more homogeneous.

There are mines of alabastrite at Volterra, in Italy, and at Lagny, in France. It yields easily to the lathe, the file, the scalpel, and the graving-tool; and very generally in Italy ornaments for common use are made of it under the name of Volterra chalk, and sold at a very low price. It receives a fine polish, although not equal to that of marble. When formed into a hollow globe, and reduced to a substance of extreme thinness, it acquires such transparency as to allow light to pass very pleasantly; which, when transmitted through it, is more vapoury than that which passes through ground glass. Although generally white, sometimes it has a veining similar to that of the Oriental alabaster.

It is easy to distinguish alabastrite from alabaster; it is less resistant, and can even be scraped by the nail; and being dissolved in acetic acid, gas is not disengaged, as is the case with alabaster, which is afterwards always of a colour tending to yellow. Besides, this latter is formed of a carbonate of lime harder than that sulphate which composes alabastrite.

Alabaster is found in stalactites and stalagmites in the caves of calcareous districts; and is there formed by the filtration of water loaded with carbonate of lime, often mixed with colouring substances, such as metallic oxides.

The large masses of alabaster are produced from closely crowded stalactites, in which fresh filtrations of similar substance have filled the vacant spaces; and consequently stripes and various undulations are visible in their interior.

Those alabasters are specially prized which have a white tint inclined to yellow, a beautiful semi-transparence, and veins of a milky white colour: this variety constitutes the Oriental, or antique alabaster. Next follow the yellowish sorts, having zones of various tints, but not differing much from the ground colour: to these varieties belong the veined alabaster, the onyx marble, and the agate marble.

The ancients used alabaster and alabastrite for making certain vases for balm, without handles; which on that account were called *ἀλάβαστρα*, from the privative particle *α*, and from *λαμβάνω*, *to take;* whence arose the name given to these two stones.

We have no proof that they made any other use of alabastrite; but they used alabaster in many other ways. In this material we have Italian and Egyptian scarabæi, and very beautiful sculpture of the Roman epoch.

V.

ALMANDINE.

This is a sort of dark red vitreous quartz, somewhat similar in colour to logwood. Some have called it violet-red spinel; but this is an error, since it has not even the hardness of the amethyst.

The red tourmaline of Ceylon has sometimes the same appearance, but not the same degree of electricity, and its light is not equally resinous.

The specific gravity of almandine is from 2·571, which, together with its slight hardness, helps to distinguish it easily from other stones which resemble it. It is seldom found in large crystals, and it is so opaque, in consequence of its dark colour, that it is only transparent when placed between the eye and the light.

Barbot declares that he has seen a very large specimen, which seemed like an inferior garnet; and, in fact, it may be well compared with the red lava of Etna or Vesuvius.

Generally, the almandine is confounded with one of the rubies which Pliny declares are found in Alabanda, and therefore named Alabandina. In fact, Boëce de Boot, copying the Roman naturalist, says that "Almandines take a place between garnets and rubies, so that they appear to be darker rubies; but they are more common than these, and have less vivid light." But such descriptions are not adapted to the kind of quartz now under consideration; which is not only inferior to the garnet, but is placed lowest amongst the coloured clear quartzes, and has no commercial value.

VI.

AMAZZONITE.

This stone, easily mistaken for green jade, on account of its colour, is nevertheless quite different, as it belongs to the felspars, of which it possesses all the properties.

The amazzonite is absolutely opaque; unlike the jade, it takes a very bright polish; its colour is a beautiful pear green, and fixing the eye on it, the longer it is looked at the brighter and more beautiful it appears. Its material is compact; no pores are visible in it: it is, however, covered with very minute marks, in the form of little straws, which are of a lighter green. When it is grey-green, the marks are of a greenish-white; and when the ground is of a darker green, the marks or points are very close to each other, and of a darker shade, although always to be clearly distinguished on the ground colour.

They are found in both East and West; in Siberia as well as in America.

There are veins of it on the Russian frontier of Mount Ouralska; and the mineralogists of that country call it *Krim-spath*, that is, green-spar; which name is more suited to the substance than that of "stone of the Amazons," or amazzonite, as this name was not the result of scientific examination, but given because the stone was found at a short distance from the River Marañon, or Amazon, near the savage American tribe of Eupinambas.

It was known to the ancients, who procured it from the East; but we are not certain by what name they particularised it. Caire speaks of a beautiful antique vase, made entirely of this stone, and which he saw in Florence.

This gem, which is easily engraved, can be used with fine effect in every sort of precious ornament.

VII.

AMBER.

Although amber is not a stone, all writers place it amongst gems, as well for its value as that it has been used ornamentally by almost every nation of the earth, from the remotest period, and anterior to every historical record.

Feuchtwanger asserts that the Phœnicians sailed to the Baltic for the sole purpose of procuring amber there. I am of opinion with Italian archæologists, that the Tyrrhenians, long before the Phœnicians, had explored those seas, and drawn from the coasts incredible quantities of amber, with which they made ornaments of every kind and domestic utensils. This is proved by the vases, cups, spindles, and other articles of unknown use, collected by me from the necropoli of the very ancient Pelasgic cities of Italy.

The Tyrrhenians, and afterwards the Phœnicians, exchanged this substance with the Greeks, who named it *electrum*, ἤλεκτρον. Homer says that the Trojan women wore necklaces of amber.

It seems that the electrical phenomena which this material exhibits were observed by the ancients, since Talete, as a result of his observations, came to the conclusion that amber was animated. Philemon and Pliny thought it a fossil; and the latter person said, "heat resuscitates amber."

Tacitus, having observed that it often contains insects,

believed that it was a vegetable juice, and from this it derives the Latin name of *succinum* or *sap*.

People used it as an amulet, and it was administered as a drug.

Even in our own day many naturalists have considered amber a mineral; but Sweigger and Brewster finally proved that it is a resinous gum; that is, the fossil juice of a now extinct tree of the primeval period, called the amber tree.

This substance is found in round nodules, which vary from the size of a grape stone to that of a man's head, and sometimes several of them are grouped together.

When broken, one surface appears concave and the other convex; it is translucent and transparent; has single refraction, and resinous light. It is found in different gradations of colour, from greenish yellow to reddish yellow. It oxidizes in the course of years, and darkens into red, but its dust is always of a whitish yellow. It scratches chalk, but is scratched by carbonate of lime.

This substance, under the action of the blow-pipe, burns with a yellow or bluish-green flame, emitting a dense smoke having a pleasing smell, and leaving a carbonized residue. Warm oil bends and makes it pliable, but it does not melt so soon as other gums, as it requires the heat of 517° Fahrenheit. By distillation it produces an acid, which from its name is called *acido succinico*, and an essential oil named *oil of amber;* whilst in the retort there remains a brown deposit, known

as amber resin, which is used as a varnish. Insoluble in water, it dissolves in alcohol, as also in a solution of subcarbonate of potass. Its component parts are carbon, hydrogen, and oxygen, with lime, alumina, and silex. Of a specific weight varying from 1·080 to 1·085, its power of refraction is from 1·365. Mixed with drying oil of linseed and essence of turpentine, it makes another excellent varnish.

Amber is found thrown from the sea on the shore. It is gathered in great abundance by the fishermen on the Prussian coasts, after the autumnal tempests of the Baltic.

It is also found in China and America; in small quantities in Sicily; and in Catania a very singular kind, of a bluish colour. Even in France some is found.

In Prussia, however, there exist numerous caves of amber, which are explored by practised miners at a depth often of more than one hundred feet. The amber of the mines differs from that of the waters only in being more brittle, and it is often covered with a thick crust of clay.

Those ambers which contain insects take the name of *insectiferous amber*.

The yellow amber cut in the form of beads, either smooth or in facets, is much used both in the East and West as a feminine adornment. In the East it is called *Karabè*, and used to ornament pipes, pistols, guns, daggers, and yataghans.

VIII.

THE AMETHYST.

THE amethyst, like all gems, is both Oriental and Western.

The Oriental amethyst is a clear corundum of a violet colour, somewhat reddish and of an elegant velvet-like appearance; very bright; perhaps less hard than the ruby; specific gravity 4; of weak double refraction; and it cuts deeply into the rock crystal. The Western amethyst can be distinguished from it by the fact that when rubbed it preserves vitreous electricity but twenty or thirty minutes, whereas the Oriental preserves it for many hours.

The Western amethyst is a clear quartz, coloured violet by the oxide of manganese which it contains: of the specific gravity of 2·7, it crystallizes in the form of a hexagon, terminated at the two heads by a species of cone with six facets. These crystals are often in masses, and the base is always less coloured than the top. The cleavage in one of such masses appears fibrous and concave in crystals of small size. The colour is more or less dark, and does not resist fire. This gem possesses double refraction, but in a moderate degree. It is motionless under the magnetic needle.

It may be remarked that amethysts are generally found in metalliferous mountains, and are always in combination with quartz and agate. This substance is found in Ceylon, Siberia, Kamtschatka, Arabia, Brazil,

Prussia, Hungary, Spain, France, and Italy. The Carthagenian Spanish amethysts are of a very beautiful purple-violet colour, very similar to that of the Oriental, to which, however, they cannot compare in hardness. The Brazils supply some very valuable, which, when cut, are worth from 1000 to 3000 lire the kilogramme. There are immense lines of them at one hundred leagues from Bahia, but the difficulty of extraction and of transport has rendered them useless hitherto.

Unpolished amethysts, in their ordinary condition, are very much prized, and it is easy to know what country they come from, because those from Siberia often have the points of the crystals mixed with chalcedony; those from the Brazils are fragments coming from considerable masses, partly fibrous and partly crystallized; those from Hungary are under the form of crystals joined together in a strange manner, whilst the largest are surrounded by many others much smaller; as to those from Mexico, they have the points of the crystals perfectly white.

There remains a great number of antique engraved amethysts, and Pliny gives as a reason for this that they are very easily cut: *Sculpturis faciles.* The Western stones were preferred, but were generally of a pale colour and rather inferior quality; and King asserts that an engraving on a dark stone may be suspected of being modern. Scarabæi, both Egyptian and Etruscan, in amethyst, are rare. Roman intagli in this stone, however abundant, are seldom of good execution.

In all ages amethysts were used as feminine ornaments. With regard to their colour, Pliny says: *Ad ricinium crystalli descendent, albicante purpuræ defectu.*

The Romans gave the name of amethyst to many different substances, beginning with violet corundum down to the purple garnet. Perhaps the name is of more ancient origin, therefore the vain Greeks interpreted it as from their language because it was believed that he who drank from an amethyst cup was secure from the effects of any poison it might contain. Arpesani remarks that the name came from α, *non*, and μέθυ, *wine;* or from α, and μεθύσκω, *to intoxicate;* and in that case it would refer to the other opinion held by the ancients, viz., that it was a powerful antidote against drunkenness.

IX.

APATITE.

This mineral was thus named by Werner, from the Greek ἀπατάω, *to deceive*, on account of its deceptive colour, which resembles that of many other precious stones; whence, before its nature was precisely determined, many mineralogists were led into error. It contains ninety per cent. of subsesquiphosphate of lime, and the rest fluoride of calcium.

It is found in hexagonal crystals; its fracture is concave; it has a vitreous lustre, of a sea-green colour, or bluish green, bluish violet, often white, and some-

times red, gray, or yellow. It is sometimes transparent, and sometimes opaque. It resembles the beryl and emerald; its specific weight is from 3 to 3·235. In some specimens, especially in the white variety, a bluish opal tint is observed in the direction of the vertical axis.

It is fragile. Some are phosphorescent in heat, others become electrical by friction. This substance does not melt under the action of the blow-pipe, excepting at its extreme edge. It dissolves slowly in nitric acid, without effervescence. On account of the phosphoric acid which it contains when solid, it is very useful as a manure.

Apatite is generally found in primitive rocks, traversing granite, serpent marble, and in the rocks of the spent volcanoes in Saxony, England, Switzerland, Norway, and many American countries, where there is a great trade in it as a material for enriching land.

Asparagine, which is a yellowish, translucent variety of apatite, is found in Estremadura.

X.

ARGIRITE.

Argirite is a stone only known in modern times by the description given of it by the ancients, who also named it *argirodama* and *magnes*, and it appears that in somewhat more recent times it was called *argentina*. Caire tells us, on the testimony of Theophrastus, that

argirite, or *magnes*, was a very lustrous stone, so like silver that it might easily be mistaken for it; its texture, and the large sized pieces in which it was found, allowed of its being formed, carved, and engraved in every manner; therefore the ancients made it even into vases, and it was much prized and used in many different ways.

Hill observes that the precious stone which the Greeks named *magnes* was totally different from that which to-day is generally understood under the name which we translate *magnetica*. Kirman gives the denomination of *argentina* to the schistose spar, which has a very bright pearly light. Haüy, at the word Argentina, says: see moon-stone. Dutens believed that argentina was a resplendent girasol on a silvery white ground; but the description of argentina does not give us the characteristics of the girasol, which always has a little yellow inside, is semi-transparent and sometimes transparent, whereas the argirite was necessarily opaque from its similarity to silver.

Caire says that by chance he became possessed of a hard stone, whose appearance led him to compare it with argirite, "which was thought quite lost, and had been sought for so long." He continued: "It is formed of very thin leaves; a very bright silvery colour pervades it, without the deviating hues which are seen in cat's eye."

I remember two objects of similar form, of unknown use and material, like cornucopiæ terminated by two horses' heads, which were in the Campana Museum.

They were of a whitish colour, and were much oxidized, whence, at first sight, it seemed a recent precipitate of silver; but this was not so, as, under the action of light, they did not become darker, but always remained white. Now, might not these two cornucopiæ have been formed of the unknown argirite? Mineralogists can see and examine them in the Paris Museum.

XI.

ASTERIA.

We read in Pliny: "After opals, amongst white jewels, the asteria naturally takes the pre-eminence, because it has enclosed in it a light, like that of the eyeball, which it sends out, now from one place, now from another, as if moving about in the jewel, and when placed facing the sun, it emits rays, whence its name." *

Is it possible from such a description to understand what stone Pliny wished to particularise? The sole distinctive character such a stone bears is the property of sending out bright rays when it reflects those of the sun. But this property is common to many gems.

I saw, some years ago, a large sapphire, very thick, cut smooth, of a whitish colour, and almost transparent, which in the sunlight presented a beautiful double star, therefore it deserved the name of *asteria*.

* Nat. Hist. xxxvii. ix. 47.

Caire saw in London a large Oriental ruby, which, when placed in the sun, gave out a luminous star, and he describes it as *an asteria-ruby;*—the star-reflecting diamond of the Mineralogical Museum, in the Jardin des Plantes, in Paris, would thus be an *asteria-diamond.* There is in the School of Mines, in Paris, a star-reflecting opaline corundum, therefore it is also an *asteria-corundum.*

It seems to me we may conclude from the above that in the present day it is not intended to give the name of *asteria* to one separate species of gem, but rather to use it as indicating the different character of various species. The imperfect knowledge of mineralogy possessed by the ancients did not enable them to distinguish the different species of precious stones by their essential characteristics; whence Pliny thought to describe and determine one single class by a quality which is common to many.

The phenomenon with regard to which these conclusions have been drawn is the result of a particular combination of molecules, which may be formed in every gem crystal; and by means of a very convex cutting, it takes place under a given inclination. If the name of asteria is retained, we may be certain that the most rare are corundums, and that amongst these the azure, or sapphires, give the appearance of stars more brilliantly.

XII.

IVORY.

Although ivory is an organic substance, and not mineral, yet writers on precious stones do not fail to speak of it as an article which at all times was largely used in works of art, and chiefly in ornaments of every kind.

Ivory is well known to be the teeth of the elephant, among which some are so large as to weigh two hundred kilogrammes, to be about three metres long, and to have at the base a circumference of almost seven hundred and fifty millimetres. They are procured from Africa and the Indies. The negroes wage a war of extermination against elephants for the sole purpose of sending ivory to the Europeans.

In art, ivory is divided into green and dry, exactly as in speaking of timber for workmen. Articles in green ivory please the eye most, because they are of a white but slightly greenish tint. Yellow ivory is inferior in value to the white, because it shows the beginning of decomposition: oxygenized muriatic acid and the steam and water of slaked lime nearly restore yellow ivory to its original whiteness.

The ivory of the hippopotamus' teeth is very much valued, because it never loses colour.

Ornaments of most beautiful design in ivory have been obtained from the ancient tombs, but, on account

of their great antiquity, they were nearly decomposed; but now means have been discovered by which their original consistency is restored. This is done by dipping them in a glutinous solution, such as, for instance, thin gum-arabic water. Burnt ivory, or ivory black, is usually put at the back of those diamonds which, not being of the purest water, are set in the manner technically called *a notte*, *i.e.*, dark, and in that case helps to give them an admirable lustre.

Fossil ivory has been excavated, of different degrees of hardness, but always recognisable by its thread-like tissue. Sometimes it preserves its natural colour; at other times it takes various tints, according to the substances amongst which it is found; hence it would be easily mistaken for a turquoise or a fossil gem, if, when cut, the colour were the same as that of the surface.

History tells us that Dipoenus and Scyllis, disciples of Dædalus, excelled in making statues of ivory and ebony. The statues of Diana and Tegea, also that of Ajax at Salamis, were entirely of ivory. The seats of the kings of Rome, and those of the consuls, were also of that material. According to Winckelmann, there were in Greece upwards of one hundred colossal statues in ivory and gold.

Boëthius the Carthaginian, Suidas of Naupacia, Parhasius of Athens, Phidias and Mys, were equally celebrated for this description of statuary work.

I have seen antique works in ivory of the Tyrrhenian, Italo-Grecian, Etruscan, Roman, and Renaissance periods, and they all gave an exact idea of the

dominant taste in the various epochs, and are examples of the best style of each.

XIII.

AVENTURINE.

It is said that the accidental discovery of the artificial composition of a red vitreous substance, sprinkled internally with bright gold-coloured filings, and similar to the quartz much used in jewels of the peruke period, caused the name of aventurine to be given to both, merely distinguishing them by the addition of *artificial* or *natural*.

Scientifically speaking, one cannot, from such a term, understand one special stone, since the agate, jasper, chalcedony, rock crystal, opal, and even the commonest fluate of lime, exhibit at times the golden filings, and therefore, as with respect to the asteria, so with the aventurine, there are stones of every species, which receive this name from the accidental quality above mentioned.

Thus Borson had a chalcedony covered internally with a golden sand: it was aventurine chalcedony. Bossi describes a garnet jasper with small golden dots: it was an aventurine jasper. In New Granada a similar stone was found, there called pentaura: it therefore is an aventurine stone.

We are of opinion that the aventurine quartz is the stone described by Pliny under the name of *sandastro:*

"Which some people call *garamantite*. It is found in India, in a place of the same name, and also in Arabia. The greatest beauty consists in the drops of gold, which always sparkle inside, but never on the surface. Some people esteem the Arabic more than the Indian stones."* There are two qualities of aventurine quartz, of which the most common, which has marks of yellow mica, or Muscovy talc, is found on the shores of the White Sea, in some mines of Silesia, of Bohemia, France, and Siberia; the other, more rare, has bright reflections from minute chinks, and is found in Spain and Scotland.

Its specific weight is from 2·6; it slightly scratches rock crystal; has a bright light, does not acquire electricity from heat, and has no power over the magnetic needle. The ground colour is generally russet-brown, but there are some of yellow, grey, reddish-white, and green with black and white marks. However, aventurine quartz has two different aspects, viz., semi-transparent and opaque: the first has the exact specific weight of 2·6670, the second 2·6426.

The great demand for aventurine quartz, when it was fashionable, originated the idea of making the stone artificially. I do not believe that chance could, by an accident happening to a workman, make such a fine combination; therefore, with many modern authors, I claim the glory for Miozzi, who, in the infancy of modern glass work, after long study, was the first to make an aventurine glass, which, excepting in hard-

* Nat. Hist. xxxvii. vii. 28.

ness, excelled all other aventurine stones. He, however, was jealous of his secret, which he carried with him to the grave.

After many years, in 1827, another Venetian, named Bibaglia, with infinite labour and perseverance, succeeded in composing a yellowish-brown enamel, tolerably consistent, but very easily melted, and superior to all other aventurine in beauty. Its analysis gives

Silex	0·652
Phosphoric acid	0·015
Deutoxide of copper	0·030
Protoxide of iron	0·065
Lime	0·080
Magnesia	0·045
Soda	0·082
Potash	0·021

This, however, like all chemical analyses, is not the formula for the real composition of this substance.

The sale of this beautiful product of Italian industry yields to our country, and especially to Venice, from fifty to eighty lire for every kilogramme of the rough material.

XIV.

AXINITE.

The name of this mineral is derived from the Latin *axis*, the edge of the axe, and was given to it because its crystalline form resembles that utensil. It is also

called *Thumerite*, from the name of Mount Thumor, where it was first procured. It is found in great agglomerations, and in somewhat different forms, which may, however, all be reduced to the rhomboidal, that is, to an oblique rhomboid or prism with four sides, so much compressed as to make the angle so sharp that it resembles the edge of an axe. It is translucent, and sometimes transparent; it has single refraction; its light is vitreous and resinous; its colour brown, violet-blue, grey, or yellow. It scratches glass, but is scratched by the topaz; it yields a whitish powder; its specific weight is from 3·27. It becomes electric when warmed or rubbed; under the action of the blow-pipe it melts into a brown-grey glass; acids have no effect on it, and it is composed of lime, alumina, and silex, with oxide of iron and manganese. It is found principally in primitive rocks, but also in others of different formations, in the Dauphiné, in the Pyrenees, in Norway, and at St. Gothard. This mineral, especially that from the Dauphiné, takes a beautiful polish.

XV.

BERYL.

The stone which the ancients named beryllus is none other than that now called aquamarina of Ceylon, of which we have already spoken.

Compared with other gems, the beryl is but little prized at the present day, being procured in great

abundance, and found in all parts of the globe; whereas the ancients had it only from India, and prized it as much as the emerald, with which they even confounded it; so that the enormous emeralds of which Theophrastus and Apion speak are now thought to have been aquamarina, as this stone is found in very large pieces.

There are very few undoubtedly antique intagli in this stone, and they are as rare as those on the emerald; the best, according to my experience, belonged to the Mertens collection. Generally the engraved beryls are Ionian work, whereas the engravings on emerald are Roman.

But although the Romans did not engrave the beryl they facetted it, and it was the only stone they cut in that manner. They used it for ear-drops and rings. When the shade of Cynthia appears to Propertius, he remarks that—

"Et solitam digito beryllon adederat ignis."

Here we may remark, it appears that the ancients applied the term "beryllus" also to a magnifying glass, and perhaps they used aquamarina for the same purpose. This supposition is rendered probable from two reasons; the first is that in the German language spectacles are called "brille," and no other derivation has been found for this word than the Latin "beryllus;" the second is that Nero is said to have looked at the spectacle in the theatres through a very large emerald. We have already seen how easily the ancients confounded the emerald with the beryl, and therefore we

do not think it unlikely that Nero's emerald was an aquamarina cut for the purpose of a magnifying glass. In corroboration of the above, we bring to the notice of the reader the fact that Nicola de Cusa, Bishop of Brixen, who died in 1454, gave the name of Beryllus to one of his works for this reason, that "by means of its assistance, people could understand things otherwise incomprehensible;" and in the second chapter he expressly says: "The beryl is a bright, transparent, colourless stone, to which a concave or convex form is given by art, and by means of which whoever looks through it sees things otherwise invisible to the naked eye."

XVI.

BOORT (KNOTTY DIAMOND).

THIS particular species of adamantine carbon, which seems placed by nature between crystallized carbon and the pure diamond, bears a name of unknown etymology, but certainly of Dutch origin.

Most frequently it is of spherical form, and its crystallization is so irregular that it resembles the most complicated knots in certain woods.

It is a mixture of molecules without order or continuity, and these, adhering solely by the force of cohesion, are the cause of its wonderful hardness. It has not any regular cleavage.

The boort is externally more rough than some

uncut diamonds; most frequently it is of a greyish white, and cannot acquire the diversified colours of the pure diamond, which it however exceeds in specific gravity. With us, it is only used to polish the regularly crystallized diamond; and for this purpose it is pounded in a mortar, and its dust, mixed with oil, and spread over a surface of soft iron, renders the friction of the two diamonds more efficacious, and thus assists in obtaining the polish and splendour of the different facets.

It is known that, whatever the variations of certain crystals, it is easy by means of their cleavage to reduce them to a regular determined form; but in the knotty diamond this is impossible, as its texture does not permit of cleavage.

The knotty diamond is found in the mines of Brazil, whence they are sent to Europe.

Some people say that the boost is cut and used by the Orientals; but, even if this be so, they certainly have not in it a bright or valuable gem.

XVII.

CACHOLONG.

A BARBAROUS name, not yet translated into any European language, and originating in Bokhara, from the words of its dialect, *cach*, river, *cholong*, stone; that is, "stone of the river." It belongs to the variety of the opal chalcedony; opaque on the surface and of a milky

white; when broken, the interior has a pearly reflection, slightly translucent at the sharp edges. Harder than the opal, this substance takes a good polish; it is unaltered under the action of the blow-pipe, and its specific weight is 2·2.

The cacholong is found in separate bits in the rivers of Bokhara, in the Feröe Islands, in Iceland, in trapp rocks, and in Greenland. It is also procured in France; and in Champigny, near Paris, it is brought from the caves of calcareous breccia, and some of it is hard, of bright cleavage, whilst others are light, rough to the touch of the tongue, and soft as chalk, and therefore of inferior quality, and to be regarded as imperfectly formed.

There is a variety of this stone called striped, coming from Feröe and Ireland, which being composed of thin strata of white and opaque opals over strata of calcedony, often bluish or greenish, makes very fine cameos. Italian artists call it French stone.

XVIII.

CALCEDONY.

This hard stone is thus named from the province of Calcedony, in Asia Minor, whence, in ancient times, it was procured in great quantities. It is a variety of agate quartz, generally of a milky-white colour, sometimes bluish; and this last tint somewhat increases its value.

The calcedony is semi-transparent, but sometimes opaque and translucent. Its cleavage, although concave, is a little scaly and quite opaque, which helps to distinguish it from the carnelian, the sardonyx, the plasma, the chrysoprase, the onyx, silex and cacholong. It is found abundantly in uniform pieces or in strata within nodules of agate, and is round, uniform, stalactiform, primitive, rhomboidal, and seldom in crystallized cubes; under this last form it encrusts crystals of shining quartz, of madrepore, of wood and of various other substances.

It is not fusible, nevertheless the colour pales under the action of heat, but without producing water.

Its specific weight is from 2·6. When analysed the result is

Silex	84
Alumina	16

Sometimes alumina gives place to lime.

Like all gems, it is distinguished into Oriental and Western. This latter, less hard than the other and also than the white agate, is of a milky light; it is common, and but little valued. There is one remarkable variety, which has red or grey dots on a striped milky ground, and is known by the name of stone of St. Stephen.

According to Pliny, the fine calcedonies so much esteemed by the ancients came from Africa; they were bought at Carthage, and then cut and engraved in Rome.

At present this stone is found in France, England, Scotland, Ireland, Transylvania, Norway, Iceland, and the Feröe Islands. Those of a green colour are procured only in India, and are very rare. Those specimens, however, are particularly prized which contain a drop of water inside, although it does not always remain, as can be observed in some rock crystals, from which the water at last disappears by means of evaporation.

The term "calcedonious stone" is applied to all gems having internally a milky tint. Rubies, sapphires, chrysolites, bluish diamonds, all diminish greatly in value when the term is applicable to them.

The ancients used the calcedony very much in making valuable ornaments; the primitive Babylonish seals, in form of the cylinder, and the latest Sassaman stamps, were formed of this stone. We also see Etruscan scarabæi and Greek and Roman intagli in this material.

Statuettes of the period of the decadence of Roman art are found in this material, and it appears that bluish calcedony was considered better, and preferred for this kind of work.

XIX.

CALCEDONYX.

This stone is very rare and little known; its name is an abbreviation of calcedon-onyx. Its rarity therefore is

the cause of the difficulty that exists in distinguishing it from the onyx agate, which it much resembles. It is much harder than this stone, but the difficulty of determining the degree of hardness without testing the stone prevents the possibility of deciding whether a given substance be really calcedonyx, except by the lapidary who tests it on his wheel.

Barbot is said to have determined the specific weight of this substance, which according to him is 2·6180.

It is often even more translucent than agate.

It appears that it came from the East, and was not only known to, but engraved by the ancients, and these engraved stones are the only specimens in existence of the calcedonyx, as, at present, none is found in any part of the world that we are aware of.

In the ancient collection of Genevosio, Caire saw an engraved calcedonyx, representing a warrior seated opposite a dead body. In the Viennese cabinet of engraved gems there is another, which represents a young man leaning on a column.

XX.

CARBON.

By this name, of which every one understands the general signification, we would specially indicate, technically, a mineral substance discovered in Brazil in the year 1842, which was found mixed with deposits of diamonds in alluvial lands and in the mud of rivers.

It is black, opaque, vitreous, of an irregular form, and of a specific weight of 3·782.

Its most precious quality, and that which alone would distinguish it from every other mineral at all resembling it, is its prodigious hardness, which quite equals that of the diamond.

This mineral, which is found in pieces varying from the weight of one to a thousand carats, has, since its discovery, been constantly used, in the same way as diamond dust, to cut and polish the diamond. It is also used in making certain graving tools capable of cutting gems of any degree of hardness.

Sometimes pieces of this carbon are found which have an evident principle of crystallization, and present a number of small, bright, white points, which, however, are devoid of transparency.

It appears that this is the raw material of the diamond before crystallization; in other words, carbon, in the last stage of density. Nevertheless, we must acknowledge that this substance is different from the diamond, inasmuch as it cannot be divided in plates, which fact is explained by its non-crystalline composition.

Subjected to a heat of 2765°, it burns with a smoky, phosphorescent flame, much less clear than that of the diamond during combustion. After being a long time subjected to a great degree of heat, it is found, on withdrawal from it, to be of the same dimensions, of equal hardness, and still without transparency, although having lost all its black colour, and become greyish white.

The carbon of which we speak can be cut into facets on the mill like the diamond, and, in that case, it reflects light while still remaining perfectly opaque.

It is found in great abundance, and therefore can be had for from six to seven lire the carat.

Its dust is preferable to that of the diamond, on account of its low price, and is found exceedingly successful in engravings on *pietra dura* and in cutting cameos.

We must not mistake this substance for the adamantine spar of China.

XXI.

CYANITE.

The name of this stone comes from the Greek κυανός, *blue*, which was given it on account of its colour. It has been known in various ages, and there is a tradition that it was wrought in England, under the reign of James I., by one Cornellius, a German artist, who called it seppara, which name it still retains in France.

The tint of the cyanite is Prussian blue, and occasionally it fades from that to grey or green.

It does not melt under the blow-pipe. It is transparent, and presents prismatic reflections, especially when cut smooth. Its specific weight is 3·5. It is not very hard, but scratches glass with its angles.

When analysed, it yields, according to Barbot,

Silex	43
Alumina	55·50
Iron	00·50

And besides, it presents traces of potassium.

The cyanite is found in granite, and in the micaceous schist of primitive mountains, either in masses or disseminated. The primitive form seems to be a quadrangular oblique prism, having watered, brilliant iridized facets. Easily broken, it has a double cleavage, and is translucent and sometimes transparent.

It is found in Asia, Europe, and America, and is also procured from St. Gothard and England.

It is easily distinguished from the blue corundum or Oriental sapphire, although in India it is cut so as to imitate the latter gem, with the view of selling it deceptively at a high price.

XXII.

CYMOPHANE.

THE name of this gem came from the Greek words κῦμα φανός, signifying "wavy light." It is of a semi-transparent greenish-yellow colour, and of concave cleavage. It scratches quartz, has double refraction, does not melt, and becomes electrical by friction. Its crystallization generally presents a straight prism, and

for base has two rectangles. It is found enclosed in a matrix of white felspar, grey quartz, and granite.

However rare, it is not of much value, although it enjoys a special singularity; when cut and polished it presents internal milky-blue reflections, which seem to follow the different inclinations given to the stone; and this peculiarity has originated the name of cymophane given to this gem by Haüy.

Up to the present time it has only been procured from Brazil, Ceylon, Connecticut, in the United States, and Nortschink, in Siberia.

The cymophane of Brazil is generally found in fragments, of the specific weight of 3·7337. When analysed, it gives

Glucine	0·1794
Alumina	0·7810
Peroxide of iron	0·0447

The cymophane of Ceylon is rather softer than the aquamarina of that island. When analysed it is found deficient in iron, which makes the colour lighter, and less inclined to green.

That from the Urals is coloured with chrome.

However, that from Brazil is better than all others.

Pliny gives the name of cymophane to a variety of greenish-yellow beryl.

Until Haüy had clearly distinguished the cymophane from all other stones, Verner believed it a chrysoberyl; Lametherie, a chrysoprase; and many others, an Oriental chrysolite.

Although the cymophane is not of a very agreeable colour, yet, when cut so as to exhibit the bright globule which it seems to contain, it acquires beauty and value. It is now used in rings, buckles, and similar ornaments. We cannot say whether the ancients knew it, or if they did, by what name they indicated it.

XXIII.

CLOROPHANE.

This is a kind of translucent felspar found in Cornovaglia, in Siberia, and principally at New Stratford, in Connecticut, United States of America.

It presents beautiful variegated colours, amongst which red, green, blue, and violet predominate.

It is prized for its phosphorescence. When placed over a flat piece of hot iron, in the dark, it emits the light of a beautiful green emerald.

The clorophane is also found in Massachusetts, and there it is in large pieces, opaque, and of a purple colour. This variety, when placed over a flat piece of heated iron, acquires phosphorescence more easily, and becomes quite white.

XXIV.

COCCA DI PERLA.

This production of the nautilus of the Indian Ocean, so much used in the last century, seems to partake of the nature of the pearl and of the mother-of-pearl. The substance of the "cocca" is identical with that of the pearl, which it seems is not produced by the nautilus.

The cocca of pearl is formed of a membrane of mother-of-pearl, often iridescent, almost always a perfect oval, and therefore very easily paired.

Although extremely brittle on account of its thinness, it is nevertheless sufficiently hard. It is rendered artificially less fragile, by dropping melted gum into its hollow. However, this operation has the disadvantage of imparting a yellowish colour to the cocca.

The cocca is obtained by sawing carefully the raised convolutions of the nautilus shell. This work is prosecuted almost exclusively in London and Holland; it merely requires a light hand which understands the handling of the saw.

At Genoa there were very clever artists, who could not only saw the nautilus with elegant precision, but make flowers and leaves of it, thus forming light inexpensive ornaments; and in this art the Genoese were excelled by none. I believe that this work has been now for a long time neglected, but it is desirable that

it should be resumed, in order that Italy may not lose an industry which belongs to her, and from which she may derive profit.

XXV.

SHELLS.

SHELLS must be permitted to enter in a small degree into this treatise, as some of them are used in making jewels and ornaments.

Such are those known by the name of *cama*, *cassis rufa*, and *cyprea*, which are upright, thick, and generally composed of strata of varied colours and different degrees of hardness. Each of these is composed of many very thin lamina, which are perpendicular to the level of the principal stratum, which is the hardest, and perfectly resembles enamel; every lamen consists of a series of prismatic, lengthened cells, adhering by their longest side.

It can easily be perceived, from this short description, that some shells can have parallel strata of different colours distinctly separated, and that, therefore, at a cheaper rate, they can take the place of the onyx and agate used by cameo workers. In fact, they make very delicate camei of them, because cut with a steel graving tool.

It is to be regretted that the art of carving shell camei, which was, it may be said, peculiar to Rome, should be now so little valued. This must be caused

by the great number of such camei lately produced, and which, in consequence of competition and coarse work, were and are sold at very low prices. This made them common, and the upper classes of society considered them merely as ornaments for their inferiors.

XXVI.

CORAL.

Coral is a marine production, the secretion of a particular polyp, agglomerated according to certain laws, and disposed so as to resemble small trees without leaves.

In the sea it is covered with an almost cartilaginous net work of very delicate texture, covered with tubercles, in the centre of each of which is the polyp, of a milky-white colour, and provided with eight tentacles round the mouth. This net-work is called the bark of the polypi; it is more delicate and soft than the centre, and is taken off in order to show the trunk, which, when out of the water, acquires the hardness of marble.

The substance of coral is composed of carbonate of lime, of organic elements in a great quantity, and of phosphate of lime.

Like all calcareous substances, it does not resist the file; it can also be cut, carved, engraved, and polished in the same manner as shells.

Alkalies do not corrode it, and in diluted acids it

loses the calcareous substance, diminishes in size, but preserves both form and colour.

The native place of the coral is, doubtless, the immense sea-shore of the Mediterranean, and principally the coast of Africa.

It is necessary here to say that the term "banks of coral," given by navigators to some reefs celebrated for numerous shipwrecks, does not at all apply to the production of which we now treat, as those banks are only agglomerations of madrepore. The coral, whose very slow growth is in proportion to the greater or less depth of its strata, which are often found from fifteen to three hundred feet deep, is now fished up abundantly by daring divers, who go and gather it with their hands or by means of an instrument made of wood and iron, in the form of a cross of St. Andrew, to the spikes of which is fastened a net, which receives the coral detached by repeated blows given by the machine.

This manner of fishing, so very injurious to the coralline rocks, is disapproved in these days, when means abound by which it could be done more successfully, and without interfering with the future formation of the coral.

For this purpose the submarine boats, one of the best of modern inventions, would be very useful; and we advise all rich speculators in coral fisheries to beware lest this essentially Italian industry be, in consequence of their negligence, transferred to France, where, of late, many have been studying the subject

carefully in order to enrich their country with the trade.

Naturalists, and those who devote themselves to this culture, agree that it is not difficult to produce this zoophyte in the different seas of every climate, and to cultivate and increase it as in the case of fish. In 1754 Lord Ellis observed that the polyp has an ovary full of infinitesimal ova, which, all joined together in a kind of thread when thrown in the sea-water, open and become little worms, that is, polyps, which, when arrived at maturity, can also produce coral in any place. Focillon, in 1856, wrote a scientific essay on the artificial formation of coral-banks in the most favourable sites. Coral is used in every sort of ornament and jewellery, and becomes the pretty blonde as well as the lively brunette. Formerly the deep red colour was preferred; at present the pale pink is in demand, and this, when natural, is most rare; but the red can be faded to this shade by placing it in an acid solution, although in this case the colour is more dull than that of the natural pink.

Barbot affirms that coral immersed in boiling olive oil loses the purple hue, and becomes yellowish grey.

The ancients knew and used the coral, called in Latin *iris nobilis*: they discoursed largely on its nature, and attributed to it medicinal virtues.

The Romans used it as an amulet, and put coronæ of it on their children's necks as a preservative from contagion. The Gauls decorated their warlike instruments with it.

In the East both men and women use it ornamentally; men in their turbans, pipes, arms, and horses' saddles; and women in the usual European manner.

I never saw camei or engravings on this material which could with certainty be said to be of anterior date to the fourteenth century. In the sixteenth, cups and sacred utensils were adorned with coral in profusion, not without elegance. Afterwards, at Genoa and Naples, necklaces and all sorts of jewelry were made of it.

XXVII.

CORUNDUM.

The name of corundum is derived from the Indian word *Korund*. In my opinion the ancients called it *Hyacinthus*. Haüy named it *Telesia*.

Corundum is a compound of aluminum.

All Oriental gems are merely vitrified corundums, coloured variously in consequence of their fundamental substance being mixed with some particular colouring principle, such as oxide of iron, oxide of chrome, oxide of titanium.

Corundum is found especially and abundantly at Matourah, in the island of Ceylon, under almost every irregular form; nevertheless, it most frequently approaches the hexahedral prism, and the double hexahedral pyramid, from which we may infer that its formation does not follow the general laws of other

crystals, and is not made by deposit, but is rather the result of fusion.

The mountains of Ilmena, in Siberia, furnish a bright blue corundum, which is found in the granite. From the rivers of India crystals of this substance are procured; they are pellucid, and therefore said to be vitrified, and so well fused that their smoothness is attributed to their having been a long time in the water. Adamantine corundum is a very hard spar, first found in China; and it lies amongst granites and mica-schists in Asia as well as in Europe.

There is also the granular corundum, called "emery," which is opaque, and of almost every colour. It is found in Saxony and Greece. Next to diamonds and carbon, corundum are, generally speaking, the hardest of all minerals.

The Chinese corundum, analysed by Klaproth, gives

Alumina	84
Silex	6·5
Oxide of iron	7·5
Waste	2

The specific gravity of vitrified corundum varies from 3·83 to 3·88, and some qualities of a clearer and brighter colour reach to 4·30. Some have double refraction; none of them melt, and they all bear to be cut and polished with emery and by the lathe without needing diamond dust.

XXVIII.

CARNELIAN.

CARNELIAN is a species of calcedony, the colour of which varies from blood red to carmine, with infinite gradations even to milky white. Its name comes from the Latin word "corneolus," the diminutive of "corneus," as this stone has the appearance of a horny substance. The French, who call the word *cornaline*, think it is derived from *caro*, *carnis*, from its flesh colour.

The carnelian is semi-transparent; its cleavage is perfectly concave, and its specific weight is from 2·6137 to 2·6301.

As analysed by Barbot, it yields

Silex	97
Alumina	3·25
Oxide of iron	0·75

and in some cases,

Colouring material	1

There is both Oriental and Western carnelian.

The Eastern carniola is very hard, of rather a bright colour, clear and transparent, without spots or undulations, and it takes a good polish. This very rare quality, found only in Persia, equals the garnet in beauty and colour. Other inferior kinds come from Surat, in India, where they are found in the bed of the

torrents. The Hindoos increase their brilliancy by subjecting them to the action of heat. The price of this substance in a rough state varies from six to ten "lire" the kilogramme.

The Western carnelian is less hard, of a clear yellowish red, and not very brilliant.

One variety, called panacea, or stigmite, is of a pale yellow red, striped white, with red or black curved lines; sometimes this kind is pale, whitish, and as if spotted with blood.

The tree carnelian has marks of ramification of a bright red colour on a very white ground.

Certain chemical agents act on this stone with the assistance of heat. When a fine carnelian is covered with carbonate of soda, and afterwards exposed to a certain heat, a silicate, hard as the stone itself, forms on the surface; whenever then, over this silicate which covers the carnelian, a design is made with a ferruginous cement, the silicate loses its colour at the points of contact and reappears in that of the carnelian. By this means, therefore, very ingenious designs can be made on the stone in question.

The ancients made no distinction between the sardonyx and the carnelian, which are often found inside one another; the sardonyx being more dense in the centre; the carnelian at the outside.

We must not silently pass over the fact that the carnelian, since the remotest period, has been used not only as an ornament but has also been cut and engraved in a thousand ways. This may be attributed to the

nature of its substance, which is not so delicate as to break easily, and yet not so hard as to resist emery.

The Tyrrhenians, Etruscans, Greeks, and Romans have left an immense quantity of engraved carnelians which were used for ring stones. The greatest number of the amulets in the form of scarabæi which have been got in the ancient tombs are of this substance. Moreover, the Roman engraved gems which have been dug up in the territory about Rome are found to be, for the most part, on carnelian.

XXIX.

CHRYSOBERYL.

This mineral is of an asparagus-green colour, crystallized in prisms of eight sides, crowned by a kind of small cupola having six facets, which subdivide occasionally in as many more little facets; notwithstanding which, its primitive form may be said to be a prism with four rectangular faces.

The hardness of the chrysoberyl is almost equal to that of the corundum. Its light is very bright; it breaks easily; is semi-transparent; does not melt under the action of the blow-pipe; has but slight double refraction; becomes electrical; its cleavage is double, and its specific weight from 3·60 to 3·76. When analysed it yields, according to Barbot,

Alumina	71
Silex	13
Glucine	18
Lime	6
Oxide of iron	5

Sometimes the chrysoberyl is prismatic.

It is found in Ceylon, Connecticut, Brazil, and Siberia. That from Brazil is generally found in transparent yellowish-green fragments. Specific gravity 3·7337.

The chrysoberyl from Siberia is chrome-coloured; in its chemical combinations the relative quantities are equal to those of the spinel. This mineral, though rather rare than otherwise, is little used in jewellery. It appears that the ancients did not know it, or at least we are in ignorance of what name they may have given it.

XXX.

CHRYSOLITE.

THE ancients gave the name of chrysolite to the topaz, and the name suited it, coming from the Greek χρυσόλιθος, which signifies "golden stone."

In modern times this name has, instead, been given to a yellowish-green stone, which is often confounded with the cymophane and the peridot, but from which, nevertheless, it differs not a little.

Less hard than all other gems, for in the scale of hardness it occupies the nineteenth grade, it is scratched by quartz, and often by the file. It crystallizes in the form of a rectangular-based prism; it has double refraction in the highest degree; it is bright and transparent. Its specific weight varies from 2·692 to 2·782. According to Klaproth, when analysed it yields

Silex	39·0
Magnesia	43·5
Oxide of iron	19·0

According to Vauquelin:

Silex	38·0
Magnesia	50·5
Oxide of iron	9·5

Its cleavage is concave; under the blow-pipe, when with borax, it melts to a pale green glass.

This substance is often distinguished by the name of the place where it was found.

The Oriental, which is sufficiently hard to scratch rock crystal, is the most esteemed; it is found in Amapapourah and different other countries of the East.

The chrysolite of Brazil is much brighter than the peridot, and often even of a beautiful golden-green colour.

That of Bohemia is rather inferior to the latter.

The chrysolite of Saxony is merely a greenish topaz, peculiar to that country.

Finally, the chrysolite of Spain crystallizes in hexahedral prisms, which are flattened at the edges and terminated at the two poles by cupolas having six facets. This Iberian species is a phosphate of lime, and is softer than all the others.

Volcanic earths, lava and basalts, often contain irregular grains which have all the characteristics of the chrysolite; nevertheless it is thought to be nothing but coloured lava, such as is found at Vesuvius.

All these substances are cut on a leaden wheel, slightly spread with emery, and then polished on the copper-mill.

The gem which we now call chrysolite was well known to, and must have been prized by the ancients; as I have had the opportunity of seeing some, set in gold and very well preserved, and I even possessed some, engraved in the best period of ancient art. Nevertheless, we shall perhaps always remain ignorant of the name which that stone then had, as also of the places where it was procured.

XXXI.

CHRYSOPRASE.

This is a rather common calcedony. Its name, from the Greek words χρυσός, πράσον, has been given it on account of the beautiful leek-green colour, or green verging on yellow, which distinguishes it.

It is generally transparent and sometimes opaque, of little brightness although it takes a good polish. Its cleavage is united and resinous. Its hardness is somewhat less than that of the calcedony. It is coloured by nickel, and when subjected to a great heat it loses its tint.

It is found in small veins or lines of about fifteen millimetres in thickness, interrupted by a green earth containing nickel. Its analysis presents

Silex	96·16
Lime	0·83
Alumina	0·08
Oxide of iron	0·08
Oxide of nickel	1·00

Its specific weight is 2·5.

The mineralogical strata of the chrysoprase are immediately under the vegetable earth, at two or three feet depth; sometimes it is procured in the clefts of the rocks, inclosed in a kind of asbestos. It is full of deep cavities, like the malachite.

The chrysoprase, unlike all other gems, is only found in Europe, and even there in but one country, that of Prussia, in the province of Silesia, in a part of the country called Kosemüth, situated on the mountain of Glasendorf, and at Stachlan, near Cologne; and for this reason it is commonly called "Prussian grey." As it always presents chinks intermingled with grains, it is not easy to understand the union of its heterogeneous parts.

It was much used in jewellery at the beginning of this century; I do not know if it was used previously, nor have I ever seen a chrysoprase, cut or engraved, which bore the stamp of antiquity.

XXXII.

ROCK CRYSTAL.

This name was given to the transparent, white vitrified quartz, probably because the finest pieces of this mineral are found on the highest mountains. It is an oxide of hydrate of silica, and crystallizes in hexahedral prisms; but this form is only met with in the perfect state in crystals which are isolated and detached from their matrix.

The rock crystal is so hard that it scratches agates, and emits sparks when struck by the steel. Its specific gravity is from 2·6548, and it is composed of silica and oxygen in equal parts, besides a very small quantity of alumina and lime. It resists fire and acids well; has double refraction, and cleavage.

It is found in every part of the globe; the Alps, Sardinia, Ceylon, Haiti, the Indies and Hungary possess it. From Madagascar and Brazil it is taken in the largest masses.

However pure this mineral may be, the lamina which compose it are not all of the same hardness. This has been proved by various experiments; nevertheless, the

forms are always identical, in the small as well as in the large crystals.

This mineral was known to the ancients. Much esteemed by the Greeks on account of its purity and regularity of formation, they made it the symbol of modesty, loyalty, and sincerity. Homer, Thucydides, and Plutarch declared their belief that it was water congealed by time into crystal. Aristotle confirmed this supposition, saying : " Ex aqua generatur crystallus remoto totaliter calido."

All ancient works in rock crystal are of beautiful designs. In Imperial Rome vases of this substance were valued very highly. Nero, when forced to fly, broke one immense vase, on which was engraved the story of the Iliad.

Rock crystal offered to the Italians of the Middle Ages a very extended industry, to which art lent additional value. The works executed on this mineral in the fourteenth and seventeenth centuries followed, according to the times, the taste prevalent in other arts of design. At present, the manufacture of artificial crystal has reduced that industry to nothing, having substituted one on a larger scale, which is practised not only by Italians, but by almost all civilized nations.

XXXIII.

DIAMOND.

The ancients gave the name of ἀδάμας, that is, "invincible," Latinized by "adamans," to this gem, because they believed it capable of resisting every chemical agent, without itself experiencing the least alteration.

In fact, the hardness of the diamond is such that it scratches all other bodies, while it cannot be scratched by any.

But this perfect hardness is not the only quality for which the gem is prized. It holds the first rank for other reasons; and in all ages it was most precious, and possessed an excessive value. The diamond is rare, not only because it is much in request, but also because it is found only in certain countries, almost always mixed with other precious minerals, in a comparatively small quantity, and scarcely ever in a state of complete crystallization: it appears that Nature elaborates it with infinite difficulty and is therefore not lavish of this gift.

The diamond, then, is a mineral substance, crystallized in octahedrons and dodecahedrons, as also in almost all the derivations of these two forms.

Its brightness is so superior to that of every other precious stone, that it is always distinguished as *adamantine.*

Its natural surface is often unequal; its sides are lined, somewhat convex, and generally appear dulled,

or, as they are commonly called, *rough*, by the evident action of fire, which Nature uses in forming them.

It breaks regularly into four principal cleavages.

Reduced to powder, it still preserves its prodigious hardness; and though it may appear that this quality might prevent its pulverization, yet it must be remembered that the hardness of a body does not generally prevent its being reduced into minute particles.

This mineral becomes electrical and phosphorescent. It acquires the first property by friction, but only preserves it fifteen or twenty seconds.

Its phosphorescent property is apparent not only in a strong light, but when shaded by glass, paper or muslin, and even covered by a sheep's skin, and behind a table of linden wood of the thickness of two hundred millimetres. In order to deprive it of phosphorescence, it must be wrapped in black or dark coloured paper.

The specific gravity of the diamond varies from 3·444 to 3·550, that is—

Oriental Diamond.

Yellow	3·550
Rose-coloured	3·531
Blue	3·525
Green	3·524
White	3·521

Diamond of Brazil.

Yellow	3·519
White	3·444

Placed in the hydrostatic balance, it loses two-fifths of its weight, and this is the sole point of resemblance between it and the white topaz of Brazil, excepting the colour.

The different specific gravity of the various diamonds under the same form is clearly produced by the different degrees of colouring, proceeding from the metallic oxides, which are heavier than the crystalline substance which contains them. It seems, however, that those contained in the American diamond are less pure, and therefore lighter.

One of the most beautiful qualities of the diamond is its power of refraction; that of water is 0·785; that of the ruby, 0·739; that of the rock crystal, 0·654; that of the diamond, 1·396.

The refraction of the diamond is single in the entire crystals; when broken, it possesses double, but imperfect refraction, in the thin layers.

The polarization of light gives in the topaz an angle of 31°; in the Strass, 35°; in the diamond, 22°.

The purest diamonds, that is, those of the finest quality, are quite devoid of colour; in other words, when facetted, they reflect all the prismatic colours.

In the mines, however, these were only found in the proportion of one-fifth; those of the second quality, and much less esteemed, are in the proportion of one-fourth, and are covered with a yellowish, greenish or bluish colour; the remainder present the most varied colours.

The colouring principles are due to oxides and me-

tallic vapours, which, in the formation of the diamond, are introduced amongst the molecules.

Coloured diamonds almost always preserve their transparency and limpidity. Some of these, of a fine yellow, have often more light than the colourless stones, but some of these become dark, and even opaque, from the presence of too much colouring material.

The largest diamonds, in a rough state, were called "parangons," and, according to their degree of purity and brightness, were said to be, as at present, "*of the first* and *second water*." Small diamonds, partly rough, are called "*grani di sale*." The so-called "old rock" diamonds are all distinguished by extraordinary light and purity, and are found in both the old and new world. Pliny states that the hardness of the diamond cannot be equalled; and that it triumphs over fire, so that it cannot be warmed. In more recent times, Cronstedt supposed that the diamond, considering its excessive hardness, ought to be regarded as a formation of particular elements, rather than of quartz and corundum.

De Born, Scopoli, Pott, Cartheuser, and Wollendorf believed it to be nothing but the purest earth. Bergman was the first who ranked it amongst combustibles. Linnæus said, the diamond was different from all other gems. Buffon looked on it as a distillation of igneous material produced from water. Guyton Morveau conjectured the diamond to be a pure water deprived of that principle which, at a certain degree of heat, renders it liquid. Baumé affirms that the diamond is

a phlogistic material in a particular condition. Valmont-Bomare calls it " the purest rock crystal."

Boëce de Boot, in 1609, suspected that the diamond was an inflammable body. Boyle, in 1673, succeeded in burning it. Newton, in 1704, having measured its refracting force, and found it greater in proportion to its density, compared with other gems, placed it immediately amongst combustibles.

Averani and Targioni, in the Florentine Academy of Cimento, made some fine experiments on the diamond, tending to prove Newton's opinion.

The celebrated Lavoisier proved the true nature of the diamond, and declared it to be carbon.

In the year 1800 Clouet, Weller, and Hachette, placing in a crucible sixty parts of iron and one of diamond, and holding it to an intense fire, obtained a piece of most perfect steel; which proved that the diamond combines chemically with iron, and therefore that it is a carbon. In progress of time similar experiments were many times repeated, and all demonstrated that the diamond resolves itself in carbonic gas.

Brewster believes it to be composed of vegetable elements. Arago holds it to be an hydrogenated carbon; Davy finally has decided that it is an oxygenized carbon.

It has never been precisely declared who first discovered the diamond, and by what nation its value was first known and prized.

It is said that the Etruscans, by means of their commerce with the interior of Africa, knew it, and

used it ornamentally. Others affirm that it was first discovered in Syria. The Greeks certainly valued it very highly, and attributed to it extraordinary magical virtues. The Romans also used it; but we cannot assert whether they had it traditionally from the Tyrrhenians, and afterwards from the Etruscans, or if it first became known to them by means of the trade between Greece and the East.

The ancients, however, only used the diamond in its natural state, without facetting it or subjecting it to any process but that of being polished.

It appears, nevertheless, that before the time of Pliny this gem was very rare in Italy. In the time of the Cæsars it became more common, owing to the more easy communication with the East.

I now have a Roman ring of the Imperial epoch, in which a beautiful hexahedral diamond is set, in its natural state, weighing about one carat. In the catalogue of the Hertz collection a similar one is described.

There are said to be five different kinds of diamonds, viz., the Indian, the Arabian, the Cyprian, the Macedonian, and the Siderite.

The two first, described by Pliny, are really diamonds; but the others are white corundums, that is, very pale sapphires, especially the Cyprian, denoted thus: *Vergens in aereum colorem.*

The most probable opinion respecting the place whence the ancients obtained the diamond is, that it was India; but the question remains yet—what was the particularly adamantiferous part of that country?

We only know that the Greeks named the central river of India, Adamas, which now is called Mahynady.

In Pliny, we find the African diamond of Gourmel mentioned, and this river flows near Constantina.

The mines and adamantine deposits of Visapour were discovered in 1430, and those of Golconda in 1662. Afterwards others were found in Borneo, in Sumatra, in the Celebes, in the gold mines of Antioquia, in Brazil, Columbia, Carthaginia, and California.

In modern times, the villages of Mannemurg and of Muddemurg, in Asia, are celebrated as being places where the largest known diamonds are found.

At Latarwar, also in Asia, the largest and finest are procured; and those of more usual size, at Gani, Malacca, Bisnagur, Gazerpelle, Gouart, Pegu, and other places situated near Mont Catti, an immense chain of granite, which extends from Bengal to Cape Cormorin.

In the last century, the most important mines were those of Parteal, situated about twenty miles from Golconda. Diamonds are also found in the River Gomel, which empties itself into the Ganges; in Krichnak, and in many other places.

Now, as formerly, the principal market for these precious gems is held at Benares and at Bowanipour, in the province of Bengal.

In the territories of the city of Pontianak and of Benjermassin, situated in the south-eastern part of the island of Borneo, and in the crystalline mountains of the north of that island, very rich mines of diamonds

are found; the most famous of them being situated near Landak, one of the principal cities.

The largest are sent to Batavia, whence they go directly to Holland. The smallest are sold at Pontianak. At Murtapsera, the ancient residence of the Sultan, the inhabitants themselves search for diamonds in the surrounding mines.

About the year 1840 diamond deposits were discovered in the district of Doladoulo, in Sumatra. In the Malays, the island of Celebes has some, but there are very few at Java.

The Chinese have so few diamonds that one can scarcely believe they possess any mines. The signs of rank, and the precious decorations of which the Celestial emperor, the imperial princes and mandarins make such parade, are in pearls, rubies, emeralds, sapphires, jade and coral, but diamonds are never seen.

In Siberia diamonds have been found in strata of ferruginous clay on Mount Ural; and this discovery has destroyed the formerly received opinion concerning the formation of this gem.

Pliny had noticed the River Gourmel, near Constantina, as being adamantiferous, and Hericart de Thury, in 1840, confirmed the truth of this opinion by presenting to the Institute of France some diamonds procured there by himself.

About the year 1729 Bernardo di Fonseca Lobo discovered very rich diamond lands, sixteen leagues long, and twelve leagues wide, at Prasile, in the province of Minas-Geraes, a district of Serra-da-Frio.

The central point of the mines here opened is the little city of Tejuco (Diamantina), situated 134 leagues from Rio de Janeiro, and 240 from Bahia. It is the residence of the general-intendant, and contains upwards of six thousand inhabitants, all employed in excavating the mines; which at the beginning yielded abundantly: the first twenty years it is calculated that about three million carats of rough diamonds were dug out; but the product did not continue in the same proportion; it diminished gradually: in the five years from 1801 to 1806 they only yielded 23,135 carats; and in the ten years from 1807 to 1817 but 18,000.

Other mines were discovered in 1839, not far from these, on a very high mountain of the same province. There are also mines at Tibbigi, near San Paulo, in the province of Goyaz; in the plains of Cubaja; in the river of Audaya; in that of Malkoverde, and also in Brazil.

BRILLIANT.

In Italy they generally denominate that diamond a "brilliant" which is cut on every side in many facets.

With us, then, the brilliant is a diamond rendered brilliant, that is, worked on the wheel to give it in certain proportions planes or facets, which, according to the laws of optics, reflecting back luminous rays, cause the gem to shine with great brilliancy.

It is not improbable that in a very remote period the Indians understood the method of polishing the diamond.

A passage in Pliny (xxxvii. iii. 15), "the polished hexahedral Indian diamond thins to a point," leads us to suppose that in his time it was known that the diamond itself was capable of wearing away other diamonds, and therefore of facetting and polishing them.

They say, however, that antiquity of about five thousand years since claims a diamond which was polished on its natural planes, and belonged to King Carna, who in India was said to have lived three thousand years before the Christian era.

It appears that until the time of Charles the Great the diamond, in Europe, was only planed on its natural facets and polished; four very large ones of this description can be seen, even now, in the buckle of that emperor's mantle.

It appears probable that even in India they then began to cut the diamond so as to add new facets to the natural ones.

About the year 1000 we find that in the jewels used by the great personages of Europe were sometimes diamonds having four rectangular planes, and one upper facet, in the form of a parallelogram, leaving the under part in its natural state, but the stone on every side being equally polished; and this particular form preserves to this day the name of *Indian*, or, technically speaking, *lustre of India.*

The wandering merchants who kept alive the Indo-European commerce through the Caucasus, the Caspian, and the steppes of Asia, were perhaps the first to bring

into Europe the ideas which the Hindoos possessed on the art of diamond-cutting. From the Bosphorus it reached the West; the Franks with Baldwin, the Venetians with Enrico Dandolo, the Hanseatics by the valley of the Danube, derived it probably from Constantinople, and brought it to France, Italy, and Holland.

Certain it is that from the beginning of the fourteenth century this art was practised with great industry in Paris and Venice; this is confirmed by the registry of the French commune and by the ancient Venetian shops. Thus, in the inventory of jewels belonging to Louigi d'Angiò, made in 1365, various diamonds are mentioned, amongst which, one having eight facets, and another in the form of a shield.

In 1407 we find that this art made remarkable progress in Paris, under the direction of a workman named Hermann, which name sounds more German than French.

About that time the Duke of Burgundy, at a banquet which he gave in the Louvre to the King of France, presented to the noble guests, amongst other gifts, eleven diamonds, valued at seven hundred and eighty-six golden crowns.

We are assured that in 1465 Bruges rivalled Paris in this respect, and amongst the legalised experts of that city there are registered in that year three diamond-cutters, or *diamants-liper*.

Finally, the same year, Louigi di Berqueen, native of Bruges, and renowned as a mathematician and gold-

smith, having perceived that the art of diamond-cutting was still in its infancy, and deriving rules for it from mathematical and optical principles, he arranged the inclination of the facets so as to produce the wonderful effects of light which are so much admired in the brilliant, and to which it has scarcely been possible to add anything from his time to our days.

A book entitled 'The Wonders of the East Indies' attributes to Berqueen not only the perfecting, but the invention of diamond-cutting. This we have already proved untrue; let it be sufficient for the Bruges goldsmith to claim the merit of having—if we may so express it—given to the diamond its true light.

Roberto di Berqueen, his nephew, relates that Charles the Bold gave him five thousand ducats as a reward for cutting three very large diamonds, of which hereafter we shall relate the history. The disciples of this celebrated engraver went to Paris and Antwerp, but for want of rough material their art languished. And thus it went on until Cardinal Mazarin gave it new impetus, and protected it, so that in Paris diamonds were cut for all the courts of Europe. He entrusted to his engravers the twelve largest diamonds of the crown of France, that they might be newly cut, and thus have their lustre increased; therefore these were called the twelve Mazarins.

About this time some Italian artists, who were very clever engravers, tried to cut the diamond. The hardness of this stone was conquered by art and perseverance. Giacomo da Trezezo, a Milanese, was the first to win

praise in this difficult work. Clement Birago, also a Milanese, cut on the diamond the likeness and coat of arms of Prince Charles, son of Philip II.; and this is asserted by Clusio, Lomazzo, and Giulianelli. It is said that the celebrated Caradosso delighted in similar work. A lion's head, a Leda, and a head of Antinous, were, according to Caire, engraved in diamond by Giovanni and Carlo Costanzi, who were Romans.

Whilst Venice, London and Amsterdam with treaties of commerce provided for the necessity of procuring sets of rough diamonds, France, after Colbert, did not foresee that the diamond mines of India would be nearly exhausted; and meanwhile fettered the art of diamond-cutting, by making regulations even to the number of tools to be retained by each artist. Thus the industry of which we speak continually declined, and although, under the great minister of Louis XIV., there had been seventy-five engravers, the greater part of them were dispersed at the revocation of the Edict of Nantes: some withdrew to Holland, others to England, and the few who remained lost their work for want of the rough material.

Under Louis XVI., near the close of the ministry of Calonne, a stranger, named Schrabsacq, wished, with the help of the State, to revive this art in Paris; he therefore opened a workshop with twenty-seven mills for cutting diamonds, but in a short time he disappeared from Paris, and went no one knew whither.

One of the engravers of the ancient Venetian school, Vincenzo Peruzzi, near the close of the seventeenth

century, when trying to deprive inferior diamonds of colour, and to cut them so that they might acquire the brightest lustre, discovered the double facetting which renders the play of light so wonderful in the brilliant, and which is now adopted in gems of the best quality. At Venice those who exercised that art continued longer than was the case in France. Some remained there even in 1825, but the last of these died blind and poor in the hospital. At present, diamond-cutting is principally practised in Holland; after that country, in England; and after England, in France, where it promises to revive.

As we have remarked, diamond-cutting, up to the present day, has necessarily varied with time and art progress. The first form was that called Indian, or Indian lustre. When the cleavage of this was known, table-cutting and cutting in thin plates were discovered, and of late years great quantities of these have been brought from India; so much so, that at the coronation of Queen Victoria it was found possible, in excess of magnificence, to present many of the guests with their likenesses in a frame which, in place of glass, had one of these leaves of large, thin diamonds. To this form, which we may call primitive, succeeded Berqueen's invention, from which this stone took the name of brilliant. The most simple cutting of the brilliant is now in sixteen facets, eight upper and eight under; in the smaller ones they often make but four upper and four under facets. Both are called single brilliants; and the sets met with in commerce, "single

sets." Double brilliants are those cut in sixty-four facets, thirty-two upper and thirty-two lower; and the sets of these met with in commerce are called double sets.

The Holland rose diamonds are cut in twenty-four upper facets, arranged so as to have the form of a cupola, the lower part remaining flat and smooth. When this work is perfect the stone is said to be well crowned. The rose diamonds having six, eight, or twelve facets are called Antwerp rose. Those called "fiamminghi," or half brilliants, have thirty-two upper facets, and a smooth surface underneath, the lower part being wanting. To these the deficient part is frequently added, being formed of common crystal equally facetted, and joined to the diamond by means of mastic; in this case it is called "doubled diamond."

In working the diamond there are three operations, viz., cleavage, cleaning, and polishing.

The weight of the finished diamond differs sensibly from that of the rough stone, as in the cutting and other operations a considerable part is lost.

Barbot calculates this diminution to be forty per cent. in diamonds of one carat, and fifty in the larger ones.

A brilliant is considered perfect when it has a regular form, a very clear colour, and is without spot or defect inside or outside. With respect to the prices of these gems, we give here Barbot's table of current prices at Paris in 1858:

Table of the Prices of Diamonds.

				Lire.
Diamond	.	of 4 grains	.. ..	75·
„		„ 3 „	.. ..	60·
„		„ 2 „	.. ..	52·50
„		„ 1 „	.. ..	45·
„	double	„ $\frac{1}{2}$ „	.. ..	45·
„	„	„ $\frac{1}{4}$ „	.. ..	47·50
„	single	„ $\frac{1}{2}$ „	.. ..	35·
„	„	„ $\frac{1}{4}$ „	.. ..	37·50
„	„	„ $\frac{1}{8}$ „	.. ..	40·

Holland Rose.

Stone of 4 grains	..	..	50·
„ 3 „	..	..	42·05
„ 2 „	..	..	40·
„ 1 „	..	..	35·
„ $\frac{1}{2}$ „	..	..	40·
„ $\frac{2}{8}$ „	..	..	41·35
„ $\frac{1}{8}$ „	..	..	45·
„ $\frac{1}{16}$ „	..	..	50·

The stones of fifty to a hundred in each grain are sold in sets of 2500 pieces, for Lire 1·20 each.

The very minute rose diamonds of one thousand to the carat, or two hundred and fifty to the grain, are worth each 20 centesimi.

HISTORICAL DIAMONDS.

The extraordinary value always attributed to large diamonds, combined with their scarcity, rendered it possible to follow for ages the history of some which belonged to high and celebrated personages, and never passed into the possession of different families or persons without great vicissitudes, of which, for the most part, mention is made in history.

In relating that Berqueen was the first who cut the gem to sixty-four facets, by which the diamond took the name of brilliant in Italy, we remarked that he had in this fashion cut three large diamonds, given to him for that purpose by Charles the Bold, Duke of Burgundy.

The first of these has now the name of Sancy; it weighs car. $33\frac{3}{4}$; it is of the first water, and in the form of a water-drop.

The brave but unfortunate duke wore this stone in his helmet the fatal day of Granson. It remained with him on the field of battle, and was there found by a Swiss soldier, who sold it to a priest for two Turin lire: the priest, without being aware of its value, resold it for three lire to some unknown person, whose traces were lost.

In 1589, by means of the form, the weight, and quality of water, this diamond was known to be in possession of the Court of Portugal. King Antonio gave it in pledge to the treasurer of the King of France, Niccola Harley de Sancy, who at last bought it for one hundred thousand "tornesi."

From the family of the treasurer, who possessed it a

long time, and from whom it took its name, Henry III. of France borrowed it. He attempted to pledge it, and so raise money for the payment of his mercenaries; and for this purpose he intended sending it to Switzerland. He therefore consigned it to a trustworthy person, who, however, was not able to reach the end of his journey, for on the road he was attacked and killed by robbers, which came to be heard of some years after, although at the time nothing was known of it. It appears, however, that the king's messenger, wishing to save the gem confided to his care, swallowed it, to disappoint the robbers. We have not heard how the magistrates of the place became aware of the fact, but it is certain that the dead body was disinterred, and the brilliant being found in its stomach, was restored to the house of Sancy.

One of the barons of this family gave it to King James II. of the Stuarts, when in exile at St. Germain, and he sold it for 625,000 tornesi to Louis XIV. Thus the Sancy entered the French treasury.

In the inventory made in 1791 it is valued at one million francs. When, in 1792, the royal treasury was robbed, it disappeared. In 1835 it was found again in the hands of a partisan of the Bourbons, who sold it to the Master of the Hunt of the Emperor Nicholas for 500,000 roubles. Now it belongs to the family Demidoff, of Petersburg.

The second diamond cut by Berqueen was given by Charles the Bold to Pope Sixtus IV. As described by Benvenuto Cellini, it always afterwards remained

in the pontifical treasury, set in various forms at different times. It is used at the grand sacred functions by the Pontiffs as an episcopal ring. It is a large thin stone, cut in long regular facets; of fine water, but of little brightness on account of the single cutting. It weighs $14\frac{1}{4}$ carats, light weight, and may now be valued at fifty thousand lire.

The third, a mis-shapen stone, was cut by the clever workman into a triangular form, and the duke had it set in one of the rings then worn, formed by two hands clasped in friendship; he gave it as a token of loyalty and friendship to Louis XI. of France.

The finest, if not the largest of known brilliants is that found in the natural adamantine deposits of Parteal, forty-five leagues south of Golconda; in its rough state it had the extraordinary weight of 410 carats; but the labour requisite for polishing them, and which lasted two years, reduced the weight to $136\frac{7}{8}$ carats. From the cutting it acquired an almost square form, with double facetting, which imparted great brightness to it. When in a rough state it was bought by the grandfather of the celebrated Pitt, when governor of Fort St. George, at Madras, for 312,500 lire. The expense of cutting it amounted to 125,000 lire. The pieces remaining from the cleavage were valued at from 75,000 to 100,000 lire. The Duke of Orleans, regent of France during the minority of Louis XV., bought it in 1717 for the sum of 3,375,000 lire, and from that time this brilliant has been called the Regent. In the inventory of the treasury of France, to which it

still belongs, its value was estimated at 12,000,000 lire; but this price is evidently exaggerated.

The largest diamond known would certainly be that said to belong to the King of Portugal, and which is included in the imperial treasure of Brazil, if there was not a reasonable suspicion that it may be really but a white topaz.

Guarded with jealous care, no exact description of this gem has ever been obtained; and this secrecy gives more foundation for the opinion that it is not a true diamond.

It is said to be of a yellowish colour, and in size nearly equal to that of a hen's egg; but in form similar to the chick-pea, and concave at one side.

It was found in Brazil, at a place called Cay-de-Merin, near the river of Malho verde. According to Ferri, it weighs 1,730 carats, and, according to Marve, 1,680. It is valued at seven thousand million lire. The slave who discovered it was set at liberty, from which fact is corroborated the aphorism that "liberty is inestimable." Besides this, the Emperor of Brazil possesses two other diamonds of less dubious quality, but of much smaller size; the largest of these two weighs 215 carats. They possess rare beauty, and were found by three bandits near Abayte, a river that runs in the province of Minas-Geraes. Marve saw them, and states that they are rough, and have a surface of 28 millimetres, and 9 in depth. Marve also affirms that he saw there two octahedral diamonds, weighing—one, 134 carats, and the other, 120.

A brilliant of pyramidal form, valued at 827,000 lire, belongs also to the Brazilian treasury, and ornaments the handle of King Giovanni's staff.

Here is still preserved the robe of state belonging to King Giuseppe I., which has twenty buttons, each of which is a single brilliant, and all together are worth 2,500,000 lire.

In the neighbourhood of Landak a diamond was found in the year 1787 which in its rough state weighed 318 carats. It belongs to the Rajah of Matau, in Borneo. In 1820 the Governor of Batavia sent Stewart to the rajah, to offer him in exchange for this gem two armed ships of war, and the sum of 150,000 dollars; but the rajah refused to give it, on account of a superstition held by his Malay subjects, who considered this stone as inseparable from the destinies of their nation, and believed that the water in which it had been immersed could cure every kind of illness.

Under the name of Nizam a diamond is known which belonged to the King of Golconda, and weighs 340 carats; its value is as much as 5,000,000 lire.

The Grand Mogul diamond was dug out of the mines of Gani. As described by Tavernier, at first it was thought by some to be a white sapphire; but, as there did not appear sufficient reason to keep to this opinion, it is now spoken of as a true diamond. A famous Indian captain, named Mirghimola, made a present of it to the Grand Mogul Aurung-Zeb. It appears that Thamas Koulikan, so celebrated under the name of Nadir Schah, took possession of this gem, which there-

fore, in Persia, would now be called Deryaï-noor, or *Ocean of light.* According to Caire, it weighed, when rough, $780\frac{4}{8}$ carats; worked, but $279\frac{3}{10}$. He affirms that it is in the form of half an egg; that it is cut in rose form, and that it is of a beautiful water, the colour tending to pink.

This gem was cut in the eighteenth century in India by one Ortenzio Borghia, an Italian.

Marco Polo, Tavernier, Methold, Chardin, Jaubert, and many other travellers, relate wonderful things of diamonds seen by them in India, and of which we have no particulars. Amongst these the most remarkable would be that which Tavernier called the Agrah, and which, according to him, weighed $645\frac{5}{8}$ carats. The Koh-i-noor, or *Mountain of light*, of which we have already made mention when speaking of diamond-cutting, belonged, it is said, to Carna, King of Anga; it is the most anciently known of all large diamonds. It weighed about 186 carats. The superstitious Hindoos believed that this diamond brought misfortune to whoever possessed it. It is said that in the seventeenth century it was given to the already-nominated Grand Mogul Aurung-Zeb, and from that hour his dynasty began to degenerate, every son being worse than his father, until 1739, when the last of these sovereigns, Mohamed Schah, in the sacking of Delhi, his capital, was deprived of the ill-omened jewel by Nadir Schah. The conqueror was assassinated by his generals on his return to Persia, and the diamond fell into the hands of one of the conspirators, Ahmed-Schah-

Doorannee, founder of the Afghan monarchy, whose history is a perpetual succession of crimes. Runjeet-Singh, Schah of the Punjaub, or Five Rivers, extorted it from the last of the Afghan kings of Caboul, Soujah-Schah; and, in order to deprive it of its fatal influence, he dedicated it to the Temple of Juggernaut. But his successor, not respecting the paternal will, took it from the temple, and the Punjaub became subject to England.

It is said that the English East Indian Company bought it for 6,000,000 lire. Lord Dalhousie presented it to Queen Victoria in 1849; and the superstitious Indian subjects of Great Britain, always retaining the same idea, attributed to the Koh-i-noor the revolt of Delhi and the death of Prince Albert.

After being taken to London it was again cut, and consequently diminished in value; nevertheless it remained extraordinary on account of its length and width.

Russia, of all states, contains perhaps the greatest number of brilliants.

The Imperial treasury has three crowns, all formed of these gems. The first, that of Ivan, contains 881; the second, that of Peter the Great, has 847. That of Catherine, which is the third, is ornamented with 2536 stones. For size, the first is that which bears the name of Orloff; it weighs 193 carats, and is as large as half a pigeon's egg; it adorns a sceptre. This diamond formed one of the eyes of the famous idol of Brama in the Temple of Scheringham. In the

first part of the eighteenth century a French soldier perceived that the two eyes of the idol consisted of precious stones of an extraordinary size, and he determined to take possession of them. For this purpose he simulated an ardent zeal for the Brahminical religion, and by that means succeeded in acquiring the complete confidence of the chief priests. He thus obtained permission to guard the temple. During a very tempestuous night he began to take the eyes of the idol out, but only half succeeded in his attempt, as he could take but one of the two brilliants. With this he fled to Madras, where he sold it for 50,000 francs to a captain of the English navy; and he, when arrived in England, sold it quickly to a Hebrew for 300,000. From the hands of the Hebrew it passed into those of a Greek merchant, who had the good fortune to yield it to Catherine II. for 2,250,000 lire and an annuity of 100,000 lire.

One of the most singular diamonds of the Russian Court is that known by the name of Schah. It has the form of an irregular prism, is of a good colour, and weighs 95 carats. It belonged anciently to the Sofi of Persia, and, lastly, to Nadir-Schah. Russia had it from some of the rebel soldiers of that conqueror.

The superb diamond called the Moon of Mountains was sold by an Afghan chief to an Armenian named Schafrass, a merchant at Bassora, for 50,000 piastres. He kept it for twelve years, and then sent his brother to Europe to try and sell it, both at the English and

Russian Courts. After long negotiations, the latter Court bought it for 450,000 silver roubles.

Finally, most beautiful amongst the jewels of the Muscovite crown is the perfectly red brilliant bought by Paul I. for 100,000 roubles.

There is in Russia, belonging to the princely House Youssoukoff, a diamond known by the name of the Polar Star, which is cut and very brilliant. It weighs 40 carats.

The House of Austria boasts of the beautiful yellow diamond called Grand Duke of Tuscany. It weighs $139\frac{4}{8}$ carats, is cut in nine sides, and covered with facets, which form a star with nine rays. It belonged, as others of which we have already spoken, to Charles the Bold, who lost it at the battle of Morat, with another smaller one, which now adorns the tiara of the Pope.

The Pacha of Egypt has a brilliant, which also is called Pacha. It weighs 40 carats, and cost 700,000 lire.

The Piggot, which in 1818 belonged to the goldsmiths, Rundell and Bridges, of London, and which weighs $82\frac{1}{4}$ carats, is perhaps the same gem which was put in a lottery in England in the year 1801 for 750,000 lire. It is not very fine.

During the wars of the eighteenth century in the territory of the Mahratta the diamond called Nassak was taken by the East Indian Company. It then weighed $89\frac{3}{4}$ carats. Cut by the order of the Marquis of Westminster, it was reduced to $78\frac{3}{8}$.

The treasury of Dresden contains an emerald green one very highly valued. It weighs $31\frac{2}{8}$ carats.

The goldsmith Bapst, of Paris, sold a black one to Louis XVIII. for 24,000 lire. It came from the Dogni collection.

The Prince of Riccia, a Neapolitan, had one of a beautiful red, which weighed 15 carats.

The merchant, Hope, of London, possessed one of a blue colour, weighing about 44 carats. On account of its rare perfection, it is thought to be the superb blue brilliant, recut, which belonged to the French crown, weighing 67 carats. It was stolen in 1792, and never again heard of.

The Prince of Piombino has the largest brilliants in Rome. Amongst these, one weighs 25 carats, is of a beautiful form, of good colour, and limpid. It was paid to Emmanuel Godoy, formerly Prime Minister of a King of Spain, for upwards of 100,000 lire.

In 1853 a negress at Bogagem, in Brazil, found one, which, when rough, weighed $254\frac{4}{8}$ carats. It was bought by the Halphens, gem merchants in Paris, who named it *The Star of the South.* When cut as a brilliant by them, it only weighed $124\frac{2}{8}$ carats. It is of oval form, 35 millimetres long, 29 wide, and only 19 deep.

These are the most celebrated and universally known diamonds; and we have rather enlarged on them, because amongst all other precious stones the diamond shines out as queen.

THE ARTIFICIAL DIAMOND.

From the days when, under the name of alchemy, that science arose which, still progressing, and established on a new basis, is called chemistry, people tried to produce artificial diamonds. The studies and experiments which alchemists made on this subject were all thrown away, for it was impossible that the diamond should be manufactured by those who were ignorant of the true component parts of that gem.

But when chemistry succeeded in discovering that the diamond is nothing but pure carbon vitrified, the hope was indulged in of obtaining it by making common carbon pass through different states by means of chemical operations. It was necessary first to melt the carbon, or dissolve it into its elements in some solution, so that the result might be a crystallization, from which should be obtained directly, or by condensation in the usual manner, pure vitrified carbon.

To the first of these two operations, not a few naturalists turned their best attention in trying experiments. But the constant study and noble perseverance with which they unceasingly pursued the desired aim—which would have been a step in advance and a splendid triumph of science—have hitherto resulted in failure.

On the contrary, it has been proved to a certain extent, that with any instruments, or by any means hitherto known, it is not possible to melt or dissolve carbon, in whatever state found.

Carbon is combustible and evaporates, when subjected to strong heat, but it never melts.

Carbon mixes with certain liquids, but never dissolves.

Carbon and the diamond crackle in the fire, but never soften.

How then, in the present state of our knowledge, can the transformation of carbon into diamond be effected?

It is self-evident, that to this end is necessary either the discovery of a new liquid or the concentration of such heat as no chemico-physical instrument has yet produced.

It appears that in the formation of the diamond Nature uses heat of an extremely high temperature, but her power infinitely exceeds that of man.

In 1828 Cagnard de la Tour sent to the Academy of Sciences at Paris ten tubes full of small crystals, of a brown colour, which he presented as crystallized carbon; after many experiments they proved to be merely various transparent silicates, harder than quartz, less so than diamond, and also incombustible.

A short time after, Gannal tried various experiments with phosphorus and sulphur; but the trial which appeared most likely to conduce to the desired end was that of the celebrated Desprez, who hoped to succeed in melting carbon by uniting all the voltaic piles in Paris, in order to concentrate the heat to a degree never previously attained, over pieces of carbon enclosed in a glass receiver. Under this terrible temperature the carbon evaporated entirely, excepting that

on the sides of the receiver was precipitated a blackish dust, which presented no signs of crystallization.

Notwithstanding this failure, Desprez continued to make other experiments, but all equally in vain.

Finally, Ebelman and Gaudin, who had discovered the method of crystallizing boron, affirmed that it might be hoped to produce even white boron, perfectly similar to the diamond, by improving their process, and taking from the crystallized boron all colouring material which makes it resemble the ruby, the sapphire and other gems.

Making the diamond, either by imitating Nature's plan or by using means partly or wholly different in order to obtain the same end, is not yet an accomplished fact; nevertheless, in these days, it may be said that nothing is impossible, and perhaps, soon, the chemist in his laboratory may produce this gem which now is sought for with so much anxiety on mountain precipices, in rivers, in the centre of Asia, of Africa and America.

XXXIV.

JASPER.

This is a dark quartz, very compact, capable of receiving a beautiful polish.

It received its name from the Greek term ἴασπις.

White jasper is very rare, and is always milky; the brown and black are also rare; but red, blue, yellow,

violet, and green are found abundantly; the latter being most common. When it is green spotted with red, it constitutes *sanguineous jasper*, the value of which increases according to the quantity and fineness of the red spots on it.

India, so rich in gems, furnishes the most beautiful of these. Some, of inferior quality, are found in Bohemia, Saxony, Siberia, England, Italy, and France.

Generally speaking, every jasper gives by analysis

Silex	60·75
Alumina	27·25
Magnesia	3·
Oxide of iron	2·05
Potash	3·66

The specific weight of jaspers varies from 2·5630 to 2·7640, and between these two extremes may be collected twenty-one different species of jasper, each of which is mixed with heterogeneous materials, which, imparting to them different colours, cause them to bear different names. The twenty-one species are always ranged under seven principal divisions, as follows:

1. Sanguineous Jasper.—This is recognised by its opaque ground, of a bright green, marked with spots of red, purple, pink, or brown. It was much prized by the ancients, who attributed to it anti-hemorrhagic and anti-apoplectic virtues. Even now it is much sought as very suitable for being engraved on.

2. Egyptian Jasper.—This includes two species, red and brown; and is marked with zones. It constitutes

the agate jasper and the onyx jasper. It is found in round, opaque pieces, and has a concave breakage; the opaque parts are pure jasper, and the zones or circles, agate. It is slightly translucent near the edges; hard and easily broken. Besides Egypt, it is found in the Grand Duchy of Baden, in a bed of ferruginous red clay. The brown kind has the different tints of its colours arranged in concentric layers; it is found particularly in the sands of Egypt, near the Pyramids, in round pebbles; it has little brilliancy, and its breakage is concave. Sometimes Egyptian jasper is called jasper of Ethiopia.

3. Striped Jasper.—This is of grey, green, red, and yellow, disposed in stripes which form designs in flames or spots. All jaspers belonging to this division, which contain more than three colours, are called flowered or variegated. Those that have a white stripe on a red ground are known as "grammasio." Striped jasper is found in a secondary argillaceous porphyry, in Scotland, Siberia, Corsica, and in Sicily, where it is very common.

4. Universal Jasper.—Presents a very great variety, without any distinct design.

5. Porcelain Jasper.—Is an imperfect volcanic vitrification, of a grey, blue, or yellow colour. It has natural crevices in every side; is opaque, not bright, and much softer than other jaspers. It can be melted, and becomes in that case a white or grey glass. It is found near vulcanized earths, and in every place where mud has been in combustion. Germany and England fur-

nish a great deal of this, and also of the opaline jasper, which is reckoned amongst jewels.

6. Common Jasper.—Is red and brown, opaque, not very hard, and of variable brightness. Under the action of the blow-pipe it does not melt, but loses colour. It takes a fine polish, and is found in Scotland, England, Germany, and Sicily.

7. Heliotrope Jasper.—The name of this stone comes from the Greek ἥλιος, *sun*, and τρέπω, *to turn*. The ancients believed that, when placed in water, it reflected the image of the sun as red as blood. They even used it as a means of observing the solar eclipses, as we do with smoked glass. It is well known how the ancients loved the marvellous, and therefore this stone was highly esteemed by them. Although similar to the sanguineous jasper in having red spots, it is easy to distinguish it as being of a brighter green, tending to azure.

When thinned it becomes translucent, and has a very beautiful effect when worked with taste.

It is found in the mountains of La Giumella and of La Valle, in Val di Fassa in Upper Italy, together with sanguineous jasper. Jasper of every kind, on account of its hardness and the quality of its texture rendering it suitable for all kinds of intaglio and relievo work, has been used for this purpose from remote times to the present day.

Therefore antique engravings on this gem are not rare. Even rings and little images in jasper are found in the excavations of ancient monuments.

Almost all the Gnostic gems are engraved green jasper. Many camei of the Byzantine period are in jasper. About the year 1600, when art began to decline, sanguineous jasper was used to carve the figure of Christ crowned with thorns and spotted with the blood which dropped from his wounds.

Great use is now made of this stone for engravings, camei, rings, bracelets, strings of beads, and other similar works.

Of the Sicilian jaspers, which are very common with us, cups, knife-handles, tables, altars, even pillars and columns are made.

XXXV.

DICHROITE.

THERE are many gems known under different names. The cause of this multiplicity of names is, in my opinion, that the first persons who found or observed a gem had not the complete knowledge of the substance of which it was composed.

It is very desirable that custom should prescribe, amongst many, one single name by which to designate the same stone, always, in order to prevent confusion in the mind of the student.

Thus the dichroite is called also, water sapphire, cordierite, iolite, peliom, steinheilite, and prismatic quartz. Amongst all these, we keep to the first, which is derived from the Greek, and has been given on account of one of its properties, which is, that of presenting two dif-

ferent colours—blue, when looked at in the direction of its axis, and dark yellow when regarded at a right angle.

It is found chiefly in hexagonal and dodecahedral prisms. Its cleavage is concave and unequal. Sometimes, the dichroite, when cut, sends out a ray of light similar to that of the asteria.

This substance scratches crystal, and is scratched by topaz; its specific gravity is 2·88; it becomes electric by friction, and acquires polarity by heat. Mixed with borax, it melts into a transparent glass, on which acids have no power.

Its component parts are magnesia, alumina, and silex, with a little oxide of iron and water.

The dichroite is found in primitive rocks, in blue chalk, in pyrites of copper, in the various kinds of quartz, in felspars, and in scattered flints.

It is brought from Spain, Bavaria, Greenland, Sweden, Norway, and Finland. In Ceylon it is found in small blue stones. In Connecticut it is embedded in granite.

Blue quartz might be mistaken for dichroite, but quartz is the hardest, and dichroite offers the phenomenon of double colour, which in the former does not exist. Many are similar to the sapphire at first sight, but eventually they are easily to be distinguished by their hardness.

XXXVI.

HEMATITE.

The hematite, or blood stone, thus called from the Greek αἷμα, *blood*, to indicate its tint, is a substance which ought not to be placed amongst gems. It is a sesquioxide of iron, as perfect as the oxide of copper which the malachite yields.

It is used for making those tools called burnishers, so necessary to goldsmiths, to setters of gems, gilders and polishers of precious stones.

We bring it to notice here, merely to remark that this mineral was the substance used in making those very ancient cylindrical seals, engraved all round, which were for the most part found in the ruins of Babylon and Nineveh, and known by the name of Assyrian cylinders, and which were used for making the impression of their engravings, in the same manner as printers use cylinders to ink type. These seals, in the opinion of antiquarians, are the most ancient oriental memorials of stone engraving.

XXXVII.

EPIDOTE.

Aluminous silicate in rhomboidal prismatic crystals, transparent and striped; of an olive green, more or less dark; it takes its name from the Greek word ἐπιδίδωμι, which signifies *to add to*, because traces are perceived of the successive increase of its volume by depositions of new strata on the outside.

This substance is by many persons called *tellite*, *deffinite*, *arendalite*, and many other names.

The epidote is found chiefly in Norway, but some is procured from France, Scotland, and Bavaria, where it is found in primitive strata.

Under the blow-pipe, this substance is changed into a brown scoria. Its specific gravity varies from 3·39 to 3·45. It has double cleavage; its hardness is less than that of quartz, and greater than that of felspar; it receives a fine polish. It is semi-translucent, and the pearly light which it emits prevents its being confounded with various kinds of idocrasio. According to three different chemists, it gives on analysis

	Vanquelin.	Descotils.	Laugier.
Silex	37	37	38
Alumina	21	27	26
Lime	15	14	20
Oxide of iron	24	17	13
Oxide of manganese ..	1·5	1·05	1
Water	1·5	—	—

XXXVIII.

ESSONITE.

This gem was at first considered a jacinth, under which name it is still denoted in commerce, and in France it is known as jacinth of Ceylon.

In mineralogical works, however, it is called *cin-*

namon or *cannellina*, on account of its colour, which resembles that of oil of cinnamon. Werner was the first to call it essonite.

The cleavage of the essonite is concave, but somewhat unequal; it has single refraction; is transparent and translucent; its light is vitreous and resinous.

It is found of a dark red, or jacinth red, or orange-yellow colour.

It scratches glass and quartz, and is scratched by the topaz.

Its specific gravity varies from 3·5 to 3·6.

It becomes electric by friction, and sometimes acts on the magnetic needle. Under the action of the blow-pipe it melts easily into a light green glass; borax and acids have no effect on it.

The essonite is found in the sand of the rivers and in the primitive rocks of Ceylon and Scotland.

It is distinguished from the gorgonzio by its superior hardness, specific gravity, and brightness, and also the absence of double refraction. The garnet is heavier, and the idocrasium lighter than the essonite, which they both very much resemble.

XXXIX.

EUCLASIO.

An aluminous silicate which crystallizes in prisms, having four oblique faces, with longitudinal lines.

This substance, in repeated analyses, never gives the same result; whence it is not possible to place it with

precision in any determined class. The following table of three analyses made by Barbot of the euclasio shows how differently it may be composed in various crystals:

	Barbot.	Vanquelin.	Berzelius.
Silex	42·62	36	48·32
Alumina ..	31·60	23	30·56
Glucine ..	21·24	15	21·78
Oxide of iron ..	2·20	5	2·22
Oxide of tin ..	·81	—	·70
Loss	1·63	21	1·40
Parts ..	100	100	100

The colour of euclasio varies from green to blue in multiplied gradations of tints, and on this account it might be placed amongst beryls, were it not for the glucine it contains, which assimilates it more to the emerald. It becomes electrical by friction and increases its cleavages.

It was from the beginning considered a green topaz, but it is distinguished from it by being more fragile and having less specific weight, not reaching to 2·9.

It has double refraction, and under the action of the blow-pipe becomes opaque, and changes into a kind of blue enamel.

XL.

FLUORINE.

This substance, known still by the mineralogical name of *fluor spar*, is very common, and found in many countries.

It has an unequal and chipped cleavage; transparent and translucent at the edges; its light is vitreous, and refraction single.

It is found of all the colours of the rainbow, either singly or mixed.

It scratches terra-cotta, but not crystal; it yields to the knife, and when pounded gives a white powder.

Its specific weight varies from 3·14 to 3·17. It becomes electric by friction; melts with ebullition under the action of the blow-pipe into an opaque substance, retaining its globular form; mixed with borax, it forms a transparent glass; it becomes phosphoric when thrown on a hot iron.

It is composed of lime and fluoric acid.

When fluorine, with its dissolvents, is placed at the fire, it emits a vapour, which is used for etching on glass. This vapour is fluoric acid, which is disengaged from the lime, with which it had been combined; it has such extraordinary corrosive power that it is injurious, and sometimes proves fatal, to smell it.

The fluorine, according to its colours when cut, takes the name in commerce of false emerald, false ruby, or

false amethyst, when it has the transparency of this gem.

It is procured principally from England and the United States of America. It is also found in Germany and Italy; that which is found in the tufa beds is beautiful and always amethystine.

In Derbyshire fluorine is cut into large vases, obelisks, columns, plates, and candlesticks, a quality being used which is indigenous to England, and with colours arranged in zones.

Fluorine was certainly known to the ancients, who made of it very elegant balsamari.

Some people think that this may have been the same substance as the celebrated *murrina*, of which so much has been spoken, without any decision as to its material having been arrived at. Nevertheless, it seems to me impossible with certainty to establish the identity of murrina with fluorine from the description of their qualities given by Pliny the elder, and this, especially, because to fluorine, which emits no smell, the sentence, "*est aliqua in odore commendatio*," is not suitable; nor to a stone, tolerably hard, does the following apply: "*ob amorem abroso ejus margine*," which the same Pliny affirms of the murrina.

In any case, the ancients were ignorant of the valuable qualities of this stone.

Not till the year 1600 of our era was it adopted as a corrosive, and in 1670 the art of engraving on glass, with its assistance, was practised at Nuremberg.

XLI.

GAGAT, OR GREEK JET.

This substance, which is a sort of compact lignite of very fine texture, and a beautiful black, presents a succession of folds, and is of easy cleavage.

Its specific gravity is 1·3, but some of it remains floating.

It catches fire quickly, emitting an unpleasant smell. When rubbed it acquires magnetic power, and therefore was also called *black amber*.

Although not hard, the gagat has sufficient consistency to allow of its being worked at the lathe, cut and polished. It can be repolished, being rubbed with walnut oil.

It is found in mines of fossil carbon, in round pebbles of every size. Very often, impressions of fish are found in it, as in slate.

In Prussia it abounds in the caves of amber, to which substance it often serves as an envelope, and to which it really bears a great resemblance.

At the present day it is used for making feminine ornaments to be worn in mourning.

In ancient times it was also used in making ornaments for women, and of this we have full proof in the beautiful articles found in 1841 at Cologne within two mortuary chests, deposited under the principal entrance of the church of St. Gideon; they consisted of buckles, armlets, rings, necklets, hair pins, and

various articles, believed to have been used ornamentally by the priestesses of Cybele.

The gagat was used in medicine and alchemy. It was also used in marking fictile vases indelibly in black: "*Fictilia ex eo inscripta non delentur.*"

XLII.

JACINTH.

This stone, of a fine reddish-yellow colour, is distinguished as either Oriental or Western.

The Oriental is much more esteemed, and chiefly for its colour and hardness. It scratches quartz, but is scratched by corundum; for which reason it cannot be mistaken for it, although some people have confounded them.

It comes from Pegu, Ceylon, and Arabia. It is very bright and receives a fine polish, although its light is rather resinous.

It crystallizes in oblong tetrahedral prisms, terminating in two short pyramids; has double refraction, and its specific gravity is from 3·631 to 3·687.

The Western jacinth is, on the contrary, a very common yellow quartz, which is found in Brazil and in France.

In colour it is more yellowish than the Oriental. On analysis it yields

Zirconium	64·5
Silex	32
Iron	2
Lead	1·5

Its specific gravity, greater than that of the jacinth of Ceylon, is from 4·38. In spite of its brightness, its light is more resinous than the other. Under the action of the blow-pipe it does not melt, but loses colour and becomes white.

Jacinths have very often a defect which diminishes their beauty and value, viz., bubbles in the interior, of which no satisfactory explanation can be given.

Some of an inferior quality, yellowish white, are found in Bohemia, Silesia, and Spain.

The essonite and idocrasio were also called jacinth, but we cannot see the reason, as they do not in any respect resemble that stone.

The gem named by the ancients hyacinthus is a corundum, and not our jacinth; we may rather believe that the latter was by them called lyncurium.

They frequently used the lyncurium, pale and dark colour equally, for engravings and camei; but for this work they preferred the dark kind, which, perhaps, was that which was called *morio*, on account of its mulberry colour, and of which Pliny says: *ad ectypas sculpturas faciendas.*

XLIII.

JADE.

A MINERAL substance very common in India and China.

It is of an olive-green colour, but there is a particular kind of it quite white, because destitute of the oxide of iron which renders jade more or less a deep green, according as it exists in greater or less quantity.

Its light is resinous; it is very compact, and lasts longer than jasper.

White jade is generally milky, opaque, and not very transparent. Its specific weight is of 2·9502; it is the hardest of all, and it more particularly bears the name of Oriental jade.

The nephrite or nephritic stone is a kind of jade which is found in Persia, Egypt, Turkey, Poland, the Hartz, and in Switzerland, generally in formless or rounded rocks. It is opaque, and its cleavage scaly; its specific weight is 3·3890.

In New Zealand a species of jade is found, somewhat different from the Oriental, as the colour is darker, and it has a specific weight of 2·2829.

America produces jade somewhat inferior in quality, but, nevertheless, tolerably hard. It undoubtedly falls from the mountains, as pebbles of it are found here and there in the plains and fields.

Oriental jade always comes to us worked, and therefore, not being known in Europe in its rough state, it

has not been possible for us hitherto to determine its nature; it is however suspected that its extreme hardness is communicated to it artificially by its being exposed to a strong fire. Nevertheless, we see jades in many burial-places with engravings or sculptures of Greek or ancient Italian work on them.

Did this stone, then, come in a rough state from the East, to be worked here, or was it found in our country?

In the middle ages it was believed that amulets in jade possessed the virtue of warding off kidney complaints, and from this came the name of *hijada*, which signifies "kidneys" in Spanish. Such, moreover, is the origin of the scientific name of *nephrite*, which has the same meaning in Greek. In the East, handles of daggers and of scimitars made of this substance are very much valued. The Hindoos make vases and shapeless statuettes of it. The inhabitants of New Zealand make it into axes and arms. The indigenous Americans made great use of it, especially for amulets, and they even knew how to pierce and carve it.

XLIV.

JARGOON.

A SPECIES of siliceous zirconite, which was so named in Ceylon. It is a vitreous substance, almost always transparent; generally either red, bluish, or even colourless, and of a particularly resinous brightness, which somewhat resembles that of the diamond.

It is always found in a crystallized state; its crystals are seldom in the octahedral form; they are generally modified prisms.

It is sufficiently hard to mark quartz, but can be marked by the topaz. It does not melt under the action of the blow-pipe, and it loses its colour when exposed to heat.

The natural white jargoon is rare, but when rendered colourless by fire it is called *diamond jargoon;* and with rose-cutting, it is used as a jewel.

This stone resists the file; but though hard, it crumbles easily. Its specific weight is 4·78. Analysed, it yields

Zirconium	70·00
Silex	25·00
Oxide of iron	00·50

It possesses double refraction in a very high degree.

Its cleavage resembles that of the diamond.

Besides the jargoon of Ceylon, there is the inferior or Western stone, which is found in the Trapp rock, near Lisbon; in the masses of sienite in the county of Galway; at Expailly in France; at Leonedo in the province of Vicenza, and in the auriferous sands of the shifting district of Lombardy.

Since jargoons of a large size are seldom found, those in commerce acquire a certain price, although never extravagantly high. A very fine pure olive jargoon, of ·012 mètres square, is worth 100 lire; one less pure, of another colour yet of equal size, costs 25 lire.

Some authors confound the jargoon with the jacinth; but the jargoon has a specific weight of 4·78, and the jacinth of 3·68; the jargoon is yellowish white, and the jacinth reddish yellow; the jargoon cannot be engraved because it is too fragile, but the jacinth is often finely cut.

XLV.

GIRASOL.

Under this name is understood a gem which reflects, in a different manner from the asteria, a combination of rays diverging from a central point like the sun.

Very many substances produce this effect, when cut in a spherical or semi-spherical form. The adularia, the hydrophane, the Brazilian chrysolite, the opal quartz, the milky corundums, the calcedony, and some agates can, by the lapidary, be converted into girasols; that is, when the work is executed in such a manner as to cause the incidental rays to converge to the central point.

Nevertheless, authors say that the girasol can be divided into Oriental and Western, like gems which are scientifically distinguished. The Oriental girasol is a vitreous corundum resembling a pale milky sapphire, somewhat reddish and yellowish, and as a corundum, its specific gravity is declared to be 4. It reflects a luminous pencil of six rays, at whatever inclination it is seen. This particular stone is Indian; and I have no

hesitation in calling it a calcedony sapphire, which being made convex, was thus turned into a girasol.

That which is called the common or Occidental girasol is a resinous quartz, of a bluish-white colour, inclining to yellow. Although harder than the opal, it cannot be compared with the corundum. It is found at Cyprus, in Brazil, Hungary, Bohemia, and principally in Siberia, where it is mixed with opal, within a soft reddish stone spotted with black.

I have already remarked that the asteria is not to be considered a separate species, nor, in my opinion, is the girasol.

XLVI.

GARNET.

This gem was named by the ancients, who called it *granatica* on account of its colour, which resembles that of the seeds of the pomegranate, *Punicum granatum*.

It would be endless to try and enumerate the places in which garnet is found, and the multiplied names given to it, according to place and colour, both by the ancients and also by modern mineralogists. I think, nevertheless, that the origin and variety of name matter very little, since the ferruginous, aluminous silicate will be always a garnet, and mineralogical science must always allow a place in its collections for

very many qualities of garnet, which, on account of slight modifications of colour, of transparency, and of growth, take, scientifically, a different name.

In general, the garnet is seldom found in veins, but more frequently in round or crystallized grains: in the first case, its surface is rough and unequal; when crystallized, it is always smooth; its primitive form is the rhombohedral dodecahedron. Either in a rough or polished state, it is not very bright, but it reflects natural light admirably.

Of a specific weight between 3·10 to 4·30, and of a degree of hardness between 6·5 and 7·5, it marks quartz and sometimes even the topaz. It yields a greenish-red powder; its fracture is more or less concave, and its refraction is single. Under the action of the blow-pipe, it melts into a kind of black enamel.

The garnet may be divided into three principal qualities, which are called:

1st. Garnet of Syriam.
2nd. Garnet of Bohemia.
3rd. Common black garnet.

The most beautiful, which comes from Pegû, the ancient Syriam, are called *amethystine garnets*, or, according to Caylus, *garnets of Syriam*.

They are of a beautiful violet-rose colour; transparent; and exactly correspond to the description given by the ancients of the *carbunculus amethystizontus*, which Pliny considered the first amongst the garnets, as it is the hardest.

When analysed, they give

Silex	39·66
Alumina	19·64
Oxide of iron	39·68
Oxide of manganese ..	1·80

They are generally cut into eight facets, of which four are large and four small. When they are without defect, and of sufficient size, their colour amongst gems is most prized. The garnet of Bohemia is also called that of Ceylon.

Its colour is so strikingly blood-red, that it is called *red garnet.* Its specific weight—greater than that of the amethyst—is 4·1888. It is less hard than the garnet of Syriam, melts with greater facility, but breaks with difficulty. Analysed, it presents

Silex	36
Alumina	20
Lime	3
Oxidized iron	41

It is found in veins, and sometimes, though but rarely, crystallized. It exerts a sensible influence on the magnetic needle; is of a very vivid blood colour, but, looked at through the light, it has a yellowish-red colour, more vivid at the edges, and almost like the jacinth.

It has the peculiar property of resisting the fire without losing either colour, weight, or transparency.

The extreme fineness of the texture of this garnet, compared with that of other European stones, is very much superior, as it equals in this respect the Balais rubies belonging to the Great Mogul.

The unchangeableness of its lovely red colour leads to the conclusion that the elementary molecules which constitute the gem must have been impregnated with colour previous to crystallization, so that it is as it were fused in it, and not received afterwards by infiltration, as generally happens in other gems. In Italy, until the beginning of this century, it was called "giacinto guarnarino."

The common black garnet is found both in the East and the West.

Their opacity results from the greater quantity of oxide of iron which they contain, and which renders them more sensitive to the attraction of the magnetic needle.

They are found in the lava thrown out by Vesuvius; scattered about the fields that surround Prague; mixed in the sands of the Alpine torrents; amongst the volcanic remains of the Tusculan mountains; in the mountains of Silesia; in Hungary, and in America. The transparent garnet was very much used in ancient times. I have seen innumerable Italian and Etruscan jewels made of this stone.

The Romans and Greeks used to engrave it for rings, but only on the decline of the Western Empire.

Pliny says that every variety of *carbunculi* obstinately resists incision. In fact, good intagli in garnet are

very rare, and the few that are to be met with belong most certainly to the Greco-Romano school.

Likenesses of the Persian kings belonging to the Sassanidæ dynasty may be often seen engraved on these gems.

Nothing is more easy than to recognise an antique intaglio on garnet; because, being very brittle, the greater number of them found are broken or in fragments. Besides, time confers on them a softness of colour which defies imitation by even the ablest artists.

XLVII.

HAUYNA.

From the illustrious Abbé Haüy, one of the most eminent mineralogists, this stone takes the name which, in compliment to him, was given it by Monticelli.

It was first discovered by Gismondi, who, having met it associated with mica and green pirosene, on Mounts Laziali, called it, hence, *Lazialite.*

Afterwards, Monticelli found it on Vesuvius.

The hauyna, then, is a substance composed of alumina, silex, potash, protoxide of iron, sulphuric acid and soda, and of which, according to the celebrated Luigi Ceselli, the exact analysis is as follows:

Silex	35·48
Alumina	18·87
Potash	15·45
Lime	12·00
Sulphuric acid	12·39
Oxide of iron	1·16
Water	1·20

It is formed in dodecahedral prisms with bright faces, and also in grains and pebbles. Its breakage is concave; it is transparent and translucent; of a strong vitreous lustre, and is composed of folds, irregularly placed, one over another. In colour, it is sometimes blue; at other times white, green, grey, or black.

It marks white glass deeply, but is sometimes marked by quartz, although but slightly. Its dust is whitish. Friction confers on it negative electricity.

Under the action of the blow-pipe, it loses colour; it does not yield water when calcined, and it melts into a white porous glass. When mixed with borax and subjected to fire, it effervesces and forms a clear glass, which becomes yellow when cool. With salt of phosphorus, it melts, with effervescence, and forms an iridescent glass. Under the action of acids, it is transformed into a gelatinous substance.

Its specific weight varies from 2·60 to 3·33. It is found in liquefied basalts, and in the vulcanized matter of Vesuvius, also at Bodemnaise, at the Lake of Laach, in various parts of Italy, in the island of Tiree, and in Scotland.

The hauyna is not much known. It is used in making rings, buckles, and ear-rings, being cut like the idocrasium, and will be always prized on account of its rarity.

XLVIII.

IDOCRASIUM.

This mineral is almost always found crystallized in the form of a prism of four sides terminated by four pyramids, and also sometimes in pebbles.

Its cleavage is parallel to all the sides of the prism. It is opaque and transparent; has double refraction; its light is between vitreous and resinous. Its breakage is concave. All its crystals are striped lengthways.

It is generally yellowish green, brown, or orange yellow, and sometimes black and blue.

It marks white glass and felspar, but can be marked by the topaz. It yields a white powder, and its specific gravity is from 3·4 to 3·8. It melts under the action of the blow-pipe into a dark glass. It is composed, like the garnet, of silex, alumina, lime, and some oxide of iron and manganese. Idocrasium is found in various geological positions, amongst volcanic and primitive rocks. When first discovered at Vesuvius it was distinguished by the name of volcanic scoria, brown jacinth, volcanic chrysolite, and Vesuvian gem; but found afterwards in the cavities of the windings on the Alps, on Ætna, in Sweden, Norway, Spain, and

America, the name of Vesuviana was changed to that of idocrasium, which is derived from εἶδος, *form*, and κρᾶσις, *mixture*, which is intended to signify the multitude of forms under which it is naturally found.

When transparent, and of a pure green or brown, it is used for rings and pins, and is principally worked in Naples and Turin.

It is cut on a leaden wheel, and receives polishing by means of the pumice-stone.

It is of little value, and is very little known to foreign traders.

The Neapolitan idocrasium is often called in mineralogy the *Italian chrysolite;* it is, however, different from the true chrysolite, having much less specific gravity. It was even mistaken for green garnet, but the hardness of the latter is much greater.

XLIX.

HYDROPHANE.

This stone is a resinous quartz.

It is almost opaque, iridescent, and has the singular property of becoming transparent when dipped in water; whence its name of ὕδωρ, *water*, and φαίνω, *to display*, that is, transparent by means of the water.

It is either white or grey, sometimes greenish and sometimes yellowish. It is solid, rather soft and

porous. It takes a good polish. Its specific weight never exceeds 2·3.

What is most extraordinary with regard to this substance is, that it adheres to the tongue, because it imbibes humidity easily.

When immersed in water, it immediately gives out little bubbles of oxygen; these were in the pores, which soon fill with water, rendering it thus clear and bright until dried up again by contact with the air.

It is found in China, Arabia, Egypt, the Feröe Isles, Hungary, Silesia, Saxony, Piedmont, and in France.

When analysed, it gives

Silex	93
Alumina	2
Water	5

From the increase of its weight, it is proved that it absorbs the liquid in which it is immersed.

Acids have no power over it, excepting tartaric acid, which makes the colour brighter. It is insoluble in ether.

It is found but seldom, and then in calcedony and opaline rocks, which must be broken in prodigious quantities before finding a really fine hydrofane.

This stone is but little used. It cuts smooth and thin, and is generally set clear, or without any background of metal or talc; so that, when immersed, all its properties may be better known and appreciated.

L.

HYPERSTHENUM.

The great hardness and the specific gravity which this mineral possesses originated its name, which in Greek signifies *supreme force*, from ὑπερ, *above*, and σθένος, *force*.

This mineral is found in crystalline masses; it has concave breakage; is opaque, and found in different colours; red, dark brown, greenish-black, and grey-black. Its cleavage is parallel to the sides. It has a metallic light. Looked at in one direction it shows gradations in copper-red, in golden or dark yellow; and in another direction it reflects greenish colours.

It marks crystal; gives a dark green dust, and has a specific gravity of 3·38.

It melts easily. Acids do not corrode it, and it is composed of magnesia, silex, alumina, and water.

It is found in the rocks of Labrador, of Greenland, and of New Jersey.

Although used in French jewellery, the hypersthenum has never been a fashionable gem, notwithstanding its beautiful colours.

LI.

IRIS.

A VARIETY of very transparent and clear rock-crystal, remarkable for its peculiar property of reflecting all the prismatic colours, by means of certain natural crevices which it contains.

There is artificial iris, which is formed by producing chinks in the rock-crystal. And this can be done by the blow of a mallet; by throwing the crystal into boiling water; or, finally, by first warming it and then throwing it into cold water.

But by all these methods crevices are produced which take their rise at external points, and never reach the centre, which remains like an intact fruit stone; whereas the natural iris, which alone is valuable, has chinks which part from the centre, and do not reach to the edges, which remain smooth and compact.

The most beautiful iris, called Oriental, has very vivid colours, but these are rendered less clear by a slight bluish-milky tint. Its specific gravity is equal to 2·640.

The iris called "calcedonyosa" presents but three visible colours when looked at against the sun.

That which is called "citrina" is a false topaz, but of very hard texture.

Many gems possess this particular phenomenon of the iris; but this, instead of increasing, diminishes

their value, as an iridised gem is considered worth only half as much as otherwise it would be.

The Empress Josephine possessed a well-known set of ornaments composed of the iris, in which the colours were so vividly reflected that it was said to be composed of brighter and more precious jewels.

LII.

JOLITE.

As already remarked, this is one of the various names of the dicroite; but it is well to know that the peculiar kind found in Sweden, and therefore called *hydro-jolite* of Sweden, is very soft, of a dark olive-green colour, and is always in red granite. This stone is not used as a jewel, and it is only valued in mineralogical collections.

LIII.

LABRADOR.

At first it was thought that this substance was an opaline felspar, but in time it was acknowledged to be a separate species.

It was discovered by some Moravian missionaries in the island of St. Paul, on the coast of Labrador, and was brought to Europe in 1775, under the name of the country where it was found.

The labrador has a grey ground with whitish stripes, and looked at when it faces the light it reflects varied colours, like the opal. Where broken, its light is between that of glass and pearl; and it is only transparent in its most minute fragments.

It is found not only in Labrador, but also in Norway, and amongst the lava of Etna and of Stromboli.

Less brittle than common spar, and still less hard, its specific weight is from 2·71 to 2·75. It melts with difficulty under the action of the blow-pipe; and it is said that it loses colour at the fire.

Its hardness is unequal. It marks white crystal, but is marked by rock-crystal. It is composed of silex, alumina, lime, soda, oxide of iron and water.

The labrador, also called *labradorite*, is only used in articles of not very small dimensions, such as snuff-boxes, clock-cases, vases, because the pieces only produce a good effect when they are of a tolerable size.

The refraction of light produces admirable effects in this mineral; so much so, that ardent imaginations fancy they perceive symbols or figures in it, created doubtless by their own desire.

In 1799 it was told to the Legitimist emigrants of France, that in Russia, a flat, broad stone of labradorite had been discovered, on which was perfectly delineated the face of Louis XVI., in azure on a greenish ground. The head of this unhappy prince was covered with a reddish crown, shaded into prismatic colours. It appeared illuminated beyond the power of art, whence it was regarded as miraculous.

It is certain that the Count of Rabassommè, who was the happy possessor of this wonder, asked 200,000 lire for it, trusting perhaps a little too much to the credulity of the simple.

LIV.

LAPIS LAZULI, OR LAZULITE.

The name of this mineral comes from the Arabic *azul*, which signifies *heaven*, and refers to its colour.

This substance was known to the ancient Romans under the name of *sapphirus*, the word with which we designate the blue corundum.

That particular kind of it which exhibits pyrites of iron in its mass was called *sapphirus regilus*.

Pliny gave the name of *cyanus* to a stone which some modern authors thought to be lapis lazuli, but from his description does not appear to be such.

Lapis lazuli is sufficiently hard to cut glass, heavy, opaque, of a blue more or less bright, often covered with brilliant ferruginous pyrites, of a close texture, and capable of receiving a bright polish. It is translucent at the edges when thinned, and breaks into vitreous fragments; it is often found crystallized in the regular form of the oblique prism, having four faces; it is in folds, and has a specific gravity which varies between 2·7675 and 2·9454.

A triple analysis gave the following results, which present a very striking difference:

	Klaproth.	Desormes.	Thenard.
Silex	46	34	44
Alumina	14·05	33	35
Lime	28	—	—
Oxide of iron ..	3	—	—
Sulphate of lime ..	6·05	—	—
Soda	—	22	21
Water	2	—	—
Sulphur	—	3	—

I believe that this difference is more the result of a different composition of the stone than of the error of chemists, as in experiments I have been able to observe that all lapis lazuli do not present the same characteristics. Thus, those that come from Persia and China unite to a finer colour an equal and very fine texture, almost similar to that of the agate; and its hardness is greater than of that found in the Siberian steppes, which to a darker colour unites a granulated texture, and is of a much inferior quality. Whence I believe that some comparative experiments would help to explain the cause of so much diversity, and render it possible to divide the lapis lazuli, like other gems, into Oriental and Western.

This gem, when exposed to a strong heat, melts into a yellowish-black mass. Under the action of the blow-pipe it forms a white crystal, but, when mixed with borax, it melts with effervescence into a very clear crystal.

As I have remarked, the most beautiful come from

China, Bucharia and Persia. They are found in Siberia, and there are traces of them on Mount Zebrà, in the district of Sondrio, and on Mont Blanc. It was found at Vesuvius by Monticelli, in small masses, sprinkled with minute dots of sulphuretted iron, embedded in granular chalk, which is chiefly of a violet colour; and in the eruption of October, 1822, a calcareous mass containing a small lazulite was thrown out.

Ceselli found a piece in 1843 in the lava of the Laziali Mountains. Recently, great quantities have been excavated in California; but the colour, which from blue tends to green, sprinkled with grey spots, renders it valueless; and in fact if the fine Oriental gem is worth upwards of 300 lire the kilogramme, the former is not worth sixty centimes.

Pieces of lapis lazuli of a good colour, free from spots, and of a tolerable size, are of great value. They are much used in jewellery and ornaments.

This stone was engraved by the ancients, though but roughly, because its material is not adapted for fine cutting. Nevertheless, the Italian artists after the sixteenth century made statuettes, busts, camei, and intagli of it; and amongst these is celebrated a piece by Gorlé, which represents the emblem of Peace.

The Chevalier d'Azara had a cameo, on a very beautiful lapis lazuli, which represented the head of Medusa. Maffei mentions an intaglio on lapis lazuli, representing Venus and Cupid.

In the treasury of the French crown there is a

beautiful collection of cups, knife-handles, and ornaments in this stone. There is a great profusion of it in the palace which Catherine II. built at St. Petersburg for Orloff; it richly adorns the villa palace of the Demidoffs at Florence, and the altars of St. Paul outside the walls of Rome. In China, statuettes and idols are made of it.

The colour which painters call ultramarine is made of lapis lazuli. We have the testimony of Camillo Leonardo that the production of ultramarine was known in Italy, most certainly from the year 1502, under the name of *azurum ultra-marinum.*

The Chinese have used it for a long time in painting on porcelain, and call the beautiful lapis lazuli *zui sang;* and that which is darker, and marked with pyrites of iron, *tchingtchang.* They choose the latter for making idols, cups and snuff-boxes.

True ultramarine is prepared chiefly in Rome. Its specific gravity is 2·36. It costs from 200 to 300 lire the ounce; and to this high price must be attributed the efforts made by painters and chemists to substitute other substances for it.

In 1828 Professor Gmelin discovered that sulphate of soda would do as a substitute. By dint of study, he succeeded in extracting that substance from silex, alumina, soda and sulphur; and now his production sells at the low price of 80 lire the kilogramme.

LV.

LAVA.

This natural production is the spontaneous union of various stony substances which volcanoes eject during their eruptions, and which, in a state of pasty fusion, flow like torrents down the sides of mountains, and sometimes to great distances.

Lava has a broken and concave breakage; a resinous light; it is opaque, and is found of almost all colours.

It often contains crystals of felspar, of leucite, of garnet, and of other minerals.

The blue lava of Vesuvius has the appearance of the blue, transparent, artificial enamel, and is in much request for jewellery and ornaments. Even cameos are made from it.

Where it most abounds, as in Naples, they use it to make vases, candlesticks, boxes, and other similar articles.

Lava is cut with iron, emery, and sand; and is polished with pumice, olive oil, and tripoli.

The graving tool is used in working on the cameo, as well as on shells.

LVI.

PETRIFIED WOOD.

Under this denomination are included, without distinction, all woods that have undergone such alterations as entitle them to be numbered amongst minerals.

Here, omitting every other kind, we must give our attention solely to the agate-wood, which most resembles fine stones.

The petrifaction of wood is a wonderful phenomenon. Trunks, branches and roots, which once had life, become mixed substances; remaining for ages buried in the earth, and preserved by the infiltration they experience, they at last acquire a great degree of hardness: the organic fibres of the once vegetating body becoming recipients of silicious saline materials.

For the petrifaction of wood, it is necessary—

1st. That it be of a nature to be preserved under ground.

2nd. That it remain there covered from air and running water.

3rd. That it be preserved from the action of corrosives.

4th. That it be in a place where there is also a concentration of liquids containing either metallic particles or stony molecules loosened, which, without destroying the ligneous body, penetrate it and become assimilated to it, at the same time that its particles dissipate by slow evaporation.

How long does Nature take for this operation?

This can never be determined.

Wood petrifies into silex, agate, and chalky substance.

The bushes which surround the so-called *Lago dei Tartari*, which is in the Tibertine territory, petrify from year to year.

It is not long since a beam of timber was found under the bed of the Danube; it had been used in the construction of the Emperor Trajan's bridge over that river, and it was found that in 1,500 years it was only petrified $\frac{3}{4}$ths of an inch from the circumference towards the centre.

Agate wood has a concave and rough breakage; it acquires a resinous light; it cuts crystal, and has a specific gravity between 2·53 and 2·65.

This substance is sometimes opaque, at other times it is transparent, but more frequently translucent.

It is easily worked as its texture yields to every tool; it is therefore used in making vases, snuff-boxes, knife-handles, and seals.

It is generally worked in Germany, and in the same way as the agates of Oberstein.

LVII.

LEPIDOLITE

Is a sort of mica with a base of lithia, thus named from the Greek λεπίς, *scale*, and λίθος, *stone*, because, in general, it is found under the form of small pebbles,

composed of scales rather bright, like mother-of-pearl, white, pink, greenish, and violet, like the scales on the wings of the butterfly.

Of this substance is made the golden, silvery, pink, blue, and black dust which is used to dry writings.

LVIII.

LUMACHELLA.

If this substance was known to the ancients, the name which they gave it is unknown to us; but we are led to believe that it is a recent discovery.

The opaline lumachella comes from Corinthia, where it is found in a mountain called Pleybourg.

There, under a ridge of lead minerals, is found a grey-brown marble which contains many fossil shells of the primitive period, which are now extinct. They are seldom found unbroken, and this will not appear strange when we consider through how many terrestrial revolutions they must have passed before being deposited amongst the substances which, together with them, form the lumachella.

Some of these shells, brought to light by the help of the saw and polish, present all the colours of the rainbow.

Art adds much to the natural effect of the lumachella, and then it clearly shows most vivid waterings of a golden red, and emerald-green colour.

The lumachella is also found in Piedmont and in France.

There is a great quantity in the Antilles and in the East.

It is not used in jewellery, but only in making useful articles, as snuff-boxes, vases, and clocks.

LIX.

LUNARIA, OR MOON-STONE.

It is under this name, described by some as the *adularia*, that the English know the moon-stone, or pietra di luna.

LX.

MALACHITE.

The name of this mineral comes from the Greek word μαλάχη, which signifies *mallows*, and was given on account of its colour.

However, it is not certain that the ancients understood by this term the same substance to which we now apply it.

Theophrastus says, "The malachite is a false emerald," and Pliny,* under the name of molochites, speaks of a mineral which "is not transparent, is of a deep green colour, and is found in Arabia."

* 'Natural History,' xxxvii. viii. 36.

Corsi states, though with hesitation, that the *molochites* was our malachite;* whilst King affirms, that under the same name the ancients understood a kind of plasma, and not the carbonate of copper, which he says the Romans called chryso-colla, from its use in soldering gold.†

If the chryso-colla is really the stone now known as malachite, it must have been very common in the time of Nero, who once caused the arena of the circus to be strewn with the powder of the chryso-colla, wishing thus to show favour to the green party.

The principal beauty of the malachite consists in the brightness of its colours. It is an oxygenized carbonate of natural copper.

It is divided into two kinds: the fibrous and the compact. The fibrous malachite is of a uniform colour of perfect emerald green. It is found in crystals of acute-angled prisms of three faces. Its crystals are needle-pointed and very thin. Its specific weight is 3·66. It presents, with diversified veining, beautiful spots in deep but brilliant green. When polished, it has a delicate, but, generally, resinous light. Its breakage is rough and bright. It decomposes in acetic acid, and communicates to it a dark green colour. It blackens only over burning coals, but crackles, becomes quite black, and at last leaves a button of pure copper under the irresistible action of the blow-pipe, having lost much of its weight.

* 'Delle Pietre,' x.

† 'Antique Gems,' page 15.

This variety is most rare, and, consequently, the most esteemed. It is found in ridges in Sweden, Hungary, Saxony, the Tyrol, and particularly on the Uralian mountains.

When analysed it yields

Copper	58
Carbonic acid	18
Oxygen	12·5
Water	11·5

The compact malachite is found in large opaque rocks, where all gradations of green are seen intertwined in zones, in concentric strata, and in segments of circles. Its breakage is unequal and its texture very fine. Its specific gravity is 3·65.

This kind is found abundantly at Goumichefsky, near Ekaterinebourg, in Siberia, in which country, unique in the world for the wealth of its copper mines, malachite under every possible form is found.

But frequently cavities occur in the large pieces, filled with earth or other foreign materials, which interrupt the natural design, and often prevent the completion of works of art in this mineral.

For jewellery, malachite of a light colour is preferred, if gradually varied and covered with darker marks, especially when some are iridescent, or marked with diverging spheres or peacock's eyes.

Its price varies from four to twenty lire the kilogramme.

The hardness and inequalities in the solidity of this

stone render it little adapted for cutting. Many attempts were made to engrave it at the beginning of this century, and many ornaments were made of it, but they did not result in good works of art.

LXI.

MARQUISITE.

Sulphuret of iron, in mineralogy and in jewellery, takes this name, which is to me of unknown etymology, unless we allow it to come from the French word *marquis*, which would in that case be the base of its name in that language, *marquisite*.

As, at the time when firearms were invented, it was used instead of flint, it therefore took the name of pirite, from the Greek πῦρ, *fire*.

The marquisite is found in large pieces, in the shape of a cube and the forms derived from it. It has a vitreous and very bright cleavage. It is found pure in various forms, including the hemispheric and dodecahedric. Its specific weight varies from 3·900 to 4·954. When cut in facets like the rose diamond it is very bright. But all the marquisites in commerce are generally small, not exceeding in size a gem of 2 carats.

There are many varieties of marquisite, some tending to bronze, others to grey, or steel colour. When struck by the steel, it emits numerous sparks which exhale a sulphurous smell.

Metallic, arsenical, and sulphurous particles abound,

more or less, in it, according to the mine from which it is extracted. It is also found with small portions of copper and very small particles of gold.

It is obtained in the Alps, in Switzerland, Piedmont, and America.

Peruvian marquisite is called *stone of the Incas*, because the ancient sovereigns of Peru attributed very great virtues to it, and wore rings and amulets which were made of it, and were enclosed with them in their sepulchres. They also used this material to make mirrors, and executed so much fine work in it as to give a high idea of their civilization.

The most beautiful kind of marquisite, of a straw-yellow colour, comes from the Vale of Antigorio, near the Lago Maggiore, but it is rare.

In the beginning of the present century marquisite was much used in feminine ornaments.

LXII.

MARBLE.

Although marble cannot be placed amongst gems, nevertheless, as a mineral, having some affinity with them, I consider it well to speak of it now briefly.

Innumerable are the minerals to which we might give the name of marble, but naturalists confine it to those only which are adapted for the chisel.

The characteristics which divide and distinguish marble from porphyry and granite are three: first,

it is freely soluble in acetic acid; in the second place, receives a mark from steel; and, finally, it is reduced to lime by fire while giving out a great quantity of carbonic acid.

Marble is partly composed of a sort of metal of ferruginous appearance, combined with carbon and oxygen. The proportions of its component parts vary according to the different qualities; however, in general, it is equal to three-tenths of metal, one-tenth of carbon, and the remainder of fixed oxygen.

The specific gravity of this substance varies from 2·650 to 2·850.

The purest marble is always white, and the various colourations which form its different qualities are due to extraneous substances, either stony or metallic, the different arrangements of which modify it by the colour of its different tints.

Marble of all kinds is amongst the productions which are most generally used in art and manufactures. But to give their history and classification would be beyond our proposed limits.

LXIII.

MICA.

For a long time, this name has distinguished certain substances capable of being divided into layers, which are elastic, very thin, translucent and fusible, of which the surface always remains bright, whence its name from

the Latin verb *micare*, to shine. Some kinds of mica are known which have only one axis of double refraction, attractive in some, repelling in others. There are even some which have two axes, and present varied degrees of divergence. These peculiarities, which are easily perceived, on account of the layers being perpendicular to the axis, indicate essential differences of crystallization, and also different species. Their composition does not offer less difference; some contain lithia, others potash, magnesia, or lime. Sometimes these substances are all united in it, in varied proportions.

Black and dark mica is found, having in it a great quantity of peroxide of iron or of the corresponding oxide of manganese, and also of chromium.

In general magnesian mica is softer to the touch, and always less elastic than the others. That kind having a base of lithia is frequently called *lepidolite*, as already remarked. Mica is often found crystallized, but only seldom under the form of regular crystals, which seem hexagonal prisms or oblique rhomboidrical prisms. Its specific gravity is 2·7. It is found particularly in crystalline earths or in primitive rocks, and it may be said to exist in every part of the earth, being found in granite and in sand, in basalts and slates, in tufa, and in the latest deposits of tertiary districts.

The colours of the different materials called mica offer every gradation of shade.

There is the downy mica, which takes its name from the resemblance it bears to down. This effect is pro-

duced by the diverging arrangement of its layers and its pearly colour. Finally, it is found in large folds or slabs, like that of glass which is used in windows.

Mica, when of a good colour, could be used for many ornaments. The ancients, under the name of *vitrum speculare*, used great squares of this substance to exclude the air from their rooms, and very often fragments of it are dug out of ancient ruins. In Siberia it is still used for this purpose, and it is put, in place of glass, in Russian ships.

The glazing of the stove invented by Dr. Nott, of New York, is of mica.

LXIV.

MOSAIC.

The place which mosaic takes in feminine ornaments, and the material of which it is formed, induce me to say a few words about it, although most frequently it is composed of materials which cannot be strictly called gems.

Mosaic is a work done in minute inlayings of glass, breccia, or agate, of varied colours, which, cemented together by a particular stucco, are formed into designs of all kinds, like colours on canvas.

From this it may be easily understood that they may be divided into three classes, viz., mosaics in glass, mosaics in breccia, and mosaics in pietra dura.

The most ancient works in mosaic are found amongst the Egyptian jewels. They consist of pieces of glass variously painted, and in enchased gold setting.

Many pavements of the Greco-Romano period were great mosaics of square marble of every colour. This work was called *opus musivum*.

After the fifth century, mosaic was used in the walls and ceilings of churches, no longer in heavy marble, but in bright square enamels, united and supported by a stucco, over a great surface, with the utmost exactness, of which we have a splendid example in the Basilica Constantiniana of St. Sophia, and St. Mark's at Venice.

In jewels of the period of Charlemagne, carnelian, plasma, and other agates have been found, set in gold, like the enamel of Egyptian work.

In the seventeenth century, at Florence, and soon after at Dresden, they made mosaics of pietra dura, that is, of agate, jasper, and other gems, worked separately first into the desired form on the wheel, and then fixed with cement into gold, bronze, or marble, to form elegant tables, beautiful ornaments, or pretty feminine adornments.

The mosaic workers of the Vatican, in the eighteenth century, began to make mosaics of glass, in very small proportions, and thus originated the so-called Roman mosaics, which were and are still executed by artists of no little cleverness, who adapt this kind of work to every kind of ornament.

LXV.

NATROLITE.

This mineral has been but recently discovered.

It received its name from the Latin *natrum*, which means *soda*, because that alkali is its principal component.

It has a rough breakage, is translucent at the edges, and of a pearly or white light; sometimes deep red or yellow, and often in alternate zones.

It scratches glass with difficulty, but can be marked by felspar. It produces a white powder; has a specific gravity of 2·16; melts under the action of the blowpipe, into a spongy, colourless glass; is composed of soda, alumina, silex and water; sometimes a small quantity of oxide of iron is mixed with it.

Natrolite is found in Switzerland, Bohemia, Saxony, Scotland, and Nova Scotia.

Natrolite, on account of the polish which it takes, has been used in jewellery, but it was not satisfactory, and now nothing is thought of this gem, so that it has no value in commerce.

LXVI.

NEPHRITE. *See* JADE.

LXVII.

NICCOLO.

A VARIETY of onyx cut in such a manner that a zone of bluish white lies over a base of deep brown.

This name is from the diminutive of onyx, viz., *onicolo*, whence *niccolo*, and not from the name of a certain Nicolo, perhaps an artist of the sixteenth century, as some assert.

This stone, of little intrinsic worth, acquires value by being used in works of cameo and intaglio.

It may almost be said that niccolo is a kind of onyx agate which has an extraordinary fineness of texture.

Its specific weight is 2·590.

Everything leads us to believe that niccolo is the Egyptilla thus described by Pliny: *Ægyptillam sacchus intelligit, per alvum sarda, nigroque venis transeuntibus: vulgus autem in nigra radice cæruleum facit.** It was often used by the ancients; this is proved by the works of intaglio and relievo which have been found executed in this stone.

LXVIII.

CAT'S EYE.

THE name of this mineral is derived from the peculiar play of light refracted by its surface, which resembles very strikingly the eye of the feline race.

* Caire, 260, note.

It consists of a quartz, mixed with parallel fibres of asbestos and amianthus.

Asbestos and amianthus are two varieties of magnesian silicates; the first, rigid in its fibres; the other soft and somewhat elastic, having a bright silken light and very fine fibres, easily separated and rather pliant.

The ancients used asbestos to make lamp wicks fed with petroleum, and being incombustible it obtained the name which is derived from the Greek *α-σβέννμι*, (*not to consume*), *incombustible.*

They wove the amianthus into a cloth, in which were wrapped the dead bodies they wished to reduce to ashes, because the amianthus being incombustible retained and preserved the ashes of the burned body. Besides, this material, becoming purified by the action of the fire and remaining in it separated from every organic element, did not, in the operation, take any blemish, whence its name of *amianto*, from the Greek *α*, *privative*, and *μιαίνω*, *to stain.*

The cat's eye is found in pebbles and in pieces more or less round; it has a concave breakage; is translucent and also transparent at the edges. It has a vitreous and resinous light. It is generally either green, red, yellow, or grey. It marks glass. Its specific gravity is from 2·560 to 2·730. When exposed to a great heat, it loses lustre and transparency, but does not melt under the blow-pipe unless reduced to minute fragments.

On analysis it gives

Silex	95·00
Alumina	1·75
Lime	1·50
Oxide of iron ..	0·25

Cat's eye is found in pieces which are never larger than half a walnut; it is found in Malabar, in the island of Ceylon, in the Hartz Mountains, in Bavaria and in the United States of America.

The finest come from Ceylon. We must be careful not to confound them with certain iridized agates which come from Arabia and Persia and much resemble them, but are softer, of a finer texture, and have brighter colours.

In order to make them shine more brightly they are cut like the asteria, but the mineralogist assigns them a higher value in the rough state.

It is not known whether the ancients were acquainted with this gem, or whether it was included in the asteria. The Moors and the Malabarese, from the remotest time, have held this stone in great veneration.

In every country of the East it is worn as an amulet, which procures riches to the possessor. The Indians believe that the largest and most beautiful have this virtue in an eminent degree.

Cat's eye, on account of its hardness, is well suited for engraving, but its colour, and the fact of its being iridized, only adapt it for such designs and ornamental figures as have been executed on this stone from the sixteenth century to the present time.

LXIX.

OLIVINE.

Silicate of magnesia, which receives the name from its colour.

It is like the chrysolite, but less transparent and less hard. It is coloured with iron. It is found in masses and also in round pebbles, as frequently in France as in Italy, Scotland, Bohemia, Ireland, on Vesuvius, and in many other places.

The cleavage of the olivine is imperfectly double, and its breakage is unequal and granulous.

Its specific gravity is equal to 3·240. Analysed it yields

Silex	50·00
Magnesia	38·5
Lime	00·25
Oxide of iron ..	12·00

Subjected to the action of the blow-pipe, with the addition of borax, it forms an opaque button of dark glass. When put into concentrated acetic acid it loses colour; this phenomenon indicates a great porosity, most rare in the texture of gems of this kind, and a principal sign by which to distinguish it from those which resemble it.

Olivine is found in pieces large and small, in basalts, in porphyry, and in lava: it is almost always with pyroxenic augite.

The Vesuvian olivine is crystallized in long striped prisms. This stone is not much thought of, and therefore of little value.

LXX.

ONYX.

A VARIETY of quartz having a regular alternation of strata more or less even, and variously coloured in black, white, brown, grey, yellow and red.

Its name comes from the Greek word ὄνυξ, *nail*, on account of the similarity which is found to exist between the arrangement of its strata and that of the human nail.

When an onyx has one or two strata of red carnelian it is more valued, and takes the name of sardonyx. In the onyx the dark strata are always opaque, and contrast strongly with the clear, which, when thinned, become almost translucent.

There are Oriental and Western onyx.

The Oriental onyx is extremely hard, and of very fine texture; acids have, in general, very little action on it. When in this mineral substance are found united neat lines, straight strata, and bright colours, it is of a relatively high price, especially if it has more than four fillets.

The Western onyx, and especially that from Germany, is softer than the Oriental, and is deteriorated by acids, which alter the colour. Industry turns this peculiarity

to good account, and gives the stone a higher value. This onyx is worked principally at Oberstein, in Germany. Lapidaries formerly chose, and now prefer, executing their Arabian and Indian onyx work in that place, and the best camei are composed of that beautiful mineral substance. The low price of German stones causes them to be much used now.

The ancients used the onyx engraved or simply cut, and very many of both kinds are still to be seen.

LXXI.

OOLITE.

This mineral is a calcareous spar composed of very minute spherical particles, whose cohesion depends on a calcareous substance which acts as a cement.

Its principal component is carbonate of lime.

The name it bears is derived from the Greek ὠόν, *ovum*, on account of its similarity to the spawn of fish. The oolite is found in pebbles or in masses. It is white, red, brown, or yellow. Large ridges of it are found in France and England.

Cut and polished it is a fine marble, and it is used in ornamenting houses, as may be seen in many houses of the city of Bath, in England.

LXXII.

OPAL.

The gem is a hydrated silicate, insoluble in acids, and when subjected to a strong heat it becomes white, leaving a remarkable quantity of water.

It possesses the property of reflecting all the coloured rays of the prism, and this property originated its name, derived from the Greek ὀπ, root of ὄπτω, (obsolete), *to see*, and ἄλλος, *other*, in allusion to the multiplicity of its colours.

The changing lights which it emits are caused by an immense quantity of minute fissures.

In general it is injured by potash. It shows no trace of crystallization, or of double refraction. Its light is almost always resinous. It is found in scattered pebbles and in veins within a matrix of a reddish tint spotted with white, in trachytic districts.

Its hardness varies, although it always yields to the file; it is of very fine texture, and takes a beautiful polish. Very brittle, its breakage is bright and perfectly concave; it does not melt under the action of the blow-pipe, but crackles, splits and loses colour.

When just extracted from the damp earth, the opal is very soft and destitute of light, but the air and sun soon succeed in giving it various degrees of beauty and consistency; and it is a very curious phenomenon to see it sensibly hardening and the colours being created as the water evaporates from the minute

chinks, in which the air immediately takes its place. This phenomenon is very clearly exhibited in the Hungarian opals.

It only preserves its brightness in a temperate atmosphere; and although sometimes it is placed in the sun that its iridescence may be increased, it spoils if left in it too long. In such a case, the bubbles of air contained in the internal chinks evaporate, and with them the colours depart; the same thing happens in an intense and prolonged frost.

Although, mineralogically, the opal may be divided into seven varieties, according to the countries where found, viz., Arabia, Ceylon, Hungary, Iceland, Scotland, Ireland, and Mexico, yet it has been generally agreed to distinguish it into three principal kinds, namely, the noble or Oriental opal, the fiery red or Mexican opal, and the common opal.

The noble or Oriental opal is called *harlequin*, on account of its many colours, which shine in triangular reflections. Its hardness, and the softness of its colours are remarkable. Its specific gravity is 2·95. When analysed, it yields

Silex	90
Water	10

It came formerly from Arabia, but now it is procured in Upper Hungary, amongst the porphyry ridges.

The Mexican fire-red opal, known also under the single name of Mexican opal, was, not many years ago, discovered by Humboldt. It is found at Zimapan, in

Mexico, in a variety of trachytic porphyry, and in the Faroe Isles in amygdaloid.

Although beautiful when just separated from the matrix, it loses much when exposed to the damp and air; when immersed in water, it comes out quite transparent and dull, but it partly re-acquires its fire when dried. Placed on the tongue, it leaves a disagreeable taste, by which it is easy to distinguish it from other varieties.

When looked at against the light it is quite transparent; in the solar rays it appears iridescent in a peculiar manner. Its specific gravity is 3·12. By applying to its surface a thin layer of olive oil, its brightness is increased, but only for a short time. It gives, on analysis,

Silex	.. ..	92·
Water	.. ..	7·75
Iron	.. ..	0·25

The common opal is found in great masses, in pebbles and in stalactites. Its breakage is concave; it is translucent and semitransparent. It is found of various colours, milky, yellowish, whitish green, red, and wine red. Sometimes it is dendritic. Its specific gravity is between 1·90 and 2·10.

It is composed of

Silex	.. .. ..	93·05
Water	.. .. ..	5
Oxide of iron	.. ..	1

It is met with in veins along with the Oriental opal, in argillaceous porphyry, and sometimes in metalliferous ridges. The opal in general cuts smooth and full, whether in an oval lenticular form or as a drop.

Fine opals are always set clear, as those set otherwise easily deceive the eye. It is well known that black increases very much the natural or artificial fire of the opal; and this is so well known, that sets of opals in commerce are always presented on a smooth, bright black card.

The common opal is of very little value; the Mexican red is of less; and the Oriental is very much esteemed.

The opal was well known to, and appreciated by the ancients.

Pliny tells us that it was found only in India.

Everybody knows that the Roman senator Nunio preferred enduring the penalties of exile rather than yield a very beautiful opal to the rapacious Mark Antony.

The Indians valued it as much as the diamond.

This gem does not take engraving well.

LXXIII.

OWAROVITE.

A SORT of garnet thus named in honour of one Owarovit, President of the Imperial Academy of Science at

Petersburg, to whom it was dedicated by the scientific Hess, who first studied it and gave it a distinct place.

It is very similar to the green garnet, but harder. It is found at Bissersk, in Siberia.

LXXIV.

TOUCHSTONE.

Touchstone is a black, hard, rugged schist, of very fine close texture.

More than any other stone, it preserves marks of whatever metals are rubbed over it; this property gained it the name of touchstone, or stone by which the qualities of the different precious metals may be tested.

This mineral substance, also called Lydian stone, is somewhat attracted by the magnetic needle, and diffuses a clayey odour when bathed in warm water. It takes a good polish, and is not hurt by acids. Its specific gravity is 2·415.

Although the touchstone is generally black, it is also found of an extremely dark green. It does not emit sparks under the flint, and is perfectly fusible without the addition of any other material, provided it be exposed to an intense fire, and then it is converted into a black or greenish glass. It is somewhat harder than horn stone properly so called; it much resembles basalt, and when broken, its fragments are rhomboidal.

The touchstone came formerly from Asia Minor; now it is found in Bohemia, Silesia, and in Saxony.

This stone may be considered as very useful in the arts, but not as a gem.

Schistose silicates, jaspers, basalts, and black "breccie" can sometimes be used instead.

Very ancient weapons have been found, made of this material.

LXXV.

PASTES.

Imitations of gems, of camei, and of engraved stones, as well as other ornaments made in glass, are, in Italy, always called *paste*. These imitations were also made by the ancients. In the Tyrrhenian tombs and on Egyptian mummies, necklaces of margherite are found, made of coloured glass.

Besides the margherite and other feminine ornaments, the Tyrrhenians made vases, cups, and balsamari, all of which were made in two different manners; some have a foundation of terra-cotta covered with a vitrification of generally-opaque colours; and these are found in the most ancient tombs. Others are of bright colours, transparent and opaque, and altogether in glass.

Amulets, also, cups, balsamari, and globules of glass, often figured and interspersed with globules of gold finely worked, are found in the Etruscan tombs, and

bear witness to the high degree which this art had reached amongst this people in Italy.

The Etruscans, however, used glass to imitate engraved agates, which they set in seal rings.

The Egyptians continued for many centuries this Tyrrhenian art, and sent out great quantities of terra-cotta ornaments covered with a vitrification, which was coloured either blue, greenish, or white. They are principally "margherite," little idols, amulets, and scarabæi of rough design; and it is strange to remark that some, of very similar design, have been found in the Tyrrhenian tombs.

In the days of Ptolemy the Egyptians made many elegant pieces of work, with very thin small sticks of varied-coloured glass, cemented together by a softer glass, almost always blue, the whole so disposed as to represent a given design.

The Greeks and Romans also cultivated this art. Pliny often laments the difficulty experienced in Rome of discerning true, from imitation glass gems, and mentions a sort of crystal "which was used in making cups (*escaria vasa*), another entirely dark red, called *hæmatinum*, and others perfect imitations of agate, lapis-lazuli, and sapphires."* The Greco-Romani fragments now found are of a thousand different kinds, and it would be tedious to describe them; some of them resemble the modern glasses of Murano.

In the third century, A.D., Egypt was already celebrated above all countries for the manufacture of its

* Nat. Hist. xxxvi. xxvi. 67.

glass; and we know that Adrian sent to his friend Servian, as a memento of his sojourn there, two precious glass cups (*calices allasontes versicolores*), which had been given him by the priest of the temple of Serapis, in Alexandria.*

After the Antonines, the art of making glass continued to flourish in Rome. This is proved by the sacred vases found in the catacombs, where, on white and transparent glass, we see figures and inscriptions in gold, all in the rough style of the period, *i.e.*, from the fourth to the eighth century.†

The dark barbarism of mediæval times makes any research useless as to the arts in glass in the Middle Ages; but the ornaments in engraved bronze, and in intaglio filled with enamel, also the stained glass in some sanctuaries, prove that it continued to the fifteenth century.

At this period, the ancient tradition of this art having perhaps been preserved in Rome and Venice, we find that it already flourished there, engraved pastes being made there of every description, in imitation of gems and glass. Of this we have proof in the laboratory of Murano, where probably the identical method of the Tyrrhenians was preserved.

In 1691, the Duke of Orleans, Regent of France, established a great laboratory of paste intagli in the Palais Royale at Paris, under the direction of the chemist Homberg. In this factory beautiful works

* King, 'Antique Gems,' page 74.

† Garucci, 'Vetri Ornati.'

were produced, which, from the originator, were called Orleans pastes.

The art of imitating gems was much improved in the last century, by means of the discovery of new chemical components by a German named Strass, in compliment to whom all transparent glass, wrought into gems and used in imitation jewels, were called Strass stones.

Towards the end of the eighteenth century there were public and private workshops in Rome, where imitation camei and glass intagli were made with such perfection as to render it difficult, if not impossible, for the most expert to distinguish the false from the true agate.

Goëthe relates, that he found the art so highly appreciated in Rome that strangers went there to practise it as amateurs. At present, Cades and Paoletti are the remaining representatives there of excellence in the art.

The filograna glasses and Venetian enamels are preferred to all made in any part of Europe.

LXXVI.

PERIDOT.

This silicate of magnesia, coloured with oxide of iron, is of a dull olive-green colour.

Being found generally enclosed in basalts and vol-

canic sands, it acquired its name from the Greek περὶ, *around*, and δέω, *to bind*, that is, *bound round.*

The peridot has all the characteristics of a volcanic production, it differs from the chrysolite in colour and texture.

It is composed of

Silex ..	..	.. 38 to 40
Magnesia	..	.. 43 to 52
Oxide of iron ..		.. 10 to 18

Its specific gravity is from 3 to 3·4. It possesses double refraction in a high degree, as its refractive power is 11°.

Although not very hard, it takes a very bright polish, which, however, diminishes in a short time. It is divided into Oriental and Western.

It is found in pebbles in Ceylon, in Persia, Egypt, and Bohemia. In Greenland it is disseminated in the masses of magnetic iron, and between the large plates of mica, in the form of greenish or reddish grains. In the Azores it is not a defined crystal, although always transparent.

The peridot is cut in the same manner as the emerald, and is sold by the carat at a very low price, unless it happens to be of extraordinary beauty.

Very often sets of tormaline are brought from Ceylon and sold as peridots; but this fraud can be easily discovered by means of the magnetic property.

The peridot was known to the ancients, but we do not know by what name.

Now it is not much valued; nevertheless, in Italy, England, and Germany, it is used.

Notwithstanding its rather soft nature, it was, and is often, engraved. A great number are found in various tombs. In that belonging to the Orleans there was a cameo in peridot representing Cato.

Crozat saw one on which was engraved a sibyl.

The Abbé Pulini had in his collection a head of Medusa beautifully executed on a peridot, remarkable for clearness and good colour.

LXXVII.

PEARL.

Under this name is understood in jewellery a concretion of carbonate of lime, round or tubercular, containing some organic substance.

It has a light peculiar to itself, and therefore called *pearly*. It is generally of a milky-white colour, but is sometimes green, red, blue, and yellow.

Its specific gravity is from 2·684; in consistency it equals all other calcareous substances, and, under the action of a diluted acid, it changes into a gelatinous substance, but only on the surface, the inner parts remaining intact. It is formed of various pellicles, one over the other, in a similar manner to the onion.

The pearl is not a gem, but simply the production of a secretion of some bivalve shell.

Different opinions are expressed by various authors as to the formation of this product. Some insist that it is an unfruitful ovum; others, that it is a stone which covers a wound accidentally given by the animal to itself; others, lastly, suppose that the bivalve covers with an animal secretion some small extraneous body, which may have entered its shell by chance, and this it does perhaps that it may not be injured by its sharp edges. This opinion seems to us to be the most reasonable. We can assert as a fact that, when any pearl is sawn in two, various strata are seen to succeed each other, regularly, to the primitive nut which occupies the centre, and is of quite a different nature from the thin pearly layers.

Feuchtwanger says that the Chinese string very small pearls on a thread, separating them with knots; then they put them inside bivalves, which are taken at the suitable moment when they are open to enjoy the sun, placing them so that they do not touch the shell. They are afterwards put into the sea, but in an enclosed place, whence they are withdrawn after many years, when the pearls are found more or less enlarged, according to the time passed, and without those spots which in others are produced by adherence to the shell.

It is thought that if a microscopic body of any form was put into a pearl oyster purposely, and that it could remain without adhering to the shell, it would serve as a nut for a pearl, which would retain its form externally.

Bivalves in which pearls are found are of three kinds, and are called in scientific language *meleagrina margaritifera*, *haliotis gigas*, *haliotis iris*.

There is another pearl, but of inferior quality, procured from a shell which is known to mariners under the name of *putellamola*, or *sea-ear*.

The most valued bivalve is the meleagrina margaritifera, otherwise known as the pearl oyster.

Pearl oysters inhabit both eastern and western seas, but always in warm latitudes.

Inferior bivalves and the pearliferous turbinite are found in other seas, and in many rivers.

Where the meleagrine are found collected in great quantities they are distinguished by the name of pearl banks. The most celebrated of these lie near the coasts of Ceylon, the Persian Gulf, near Japan, in the waters of Java and Sumatra, near the Isthmus of Panama, and at the mouths of the Rio la Hacha, in America.

The ear-shells and bivalves which live in rivers are taken by hand; but, on account of marine monsters, the fishing of meleagrine oysters is very dangerous, as they adhere to the deep submarine rocks.

In the East pearl fishers before going out receive extreme unction from their priests; and, on reaching the pearl bank, they murmur a prayer, throw themselves into the sea, rake up oysters as long as they can remain under water, and then rise up to deposit their take in the boats. After a little rest, they return to their dangerous fishing.

The daring Americans go to Panama to fish pearliferous bivalves in the depths of the ocean, rivalling each other in vigour and dexterity.

The quiet Swede, while seated in his boat, seeks the meleagrine in the depths of his seas, and loosens them from the rocks with solid and long pincers of iron.

The pearls which are brought by the fishers are called *virgin pearls.* The merchant classifies and divides them according to form, colour, and quality; puts the round ones together, pairs those in form of a pear, takes away the irregular ones, which are called *barocche*, or *out of the round*, and puts the smallest ones aside.

The round pearls are pierced and strung with a silken thread, and often with much art, to give a better effect, whilst the equality of colour and of size greatly influence their price.

A perfect pearl ought to be without inequalities of surface. Whatever its form, pure, of a silvery white colour, slightly blue or yellow, without roughness, and rather bright. In such condition pearls weighing

1	grain	are worth	25	lire	the pennyweight.
2	„	„	69	„	„
3	„	„	150	„	„
4	„	„	300	„	„

and so on; the value increases according to the size; but when they weigh more than two pennyweights they obtain fancy prices.

The *barocche* pearls are rather valued in Spain and in Poland. The smallest are sold by the ounce.

There are some which, on account of the singularity of their form, have been compared to different objects and figures.

The goldsmith avails himself of this peculiarity by making art finish that which Nature has, so to say, merely sketched; and, by means of the setting in gold, and the addition of other ornamental stones, brighter and better formed, making a desired figure. Caire saw in one pearl almost the head of a dog; in another the golden fleece; and in a third he thought he perceived the form of the famous torso of Belvidere. Amongst all feminine ornaments the pearl is that which is the most becoming to youth. Unlike all other gems, it cannot be beautified by the hand of man, who, in trying to improve it, spoils it.

It is falsely affirmed by some that the yellow tint they acquire in the course of years by contact with the air can be counteracted, either by cooking them in bread, rubbing them with rice, boiled salad, or placing them for a short time in the gastric juice of a fowl recently killed.

Italian jewels are often found set with pearls. In the New Testament they are mentioned. Twenty centuries ago they were used as ornaments in Greece.

Theophrastus thought them equal to precious stones. Julius Cæsar made a present to Servilia, mother of Brutus, of a pearl which had cost him a sum equal to one million two hundred thousand lire.

In one of Pompey's triumphs there were amongst the spoils of the conquered thirty-three crowns of pearl.

Who has not heard of Cleopatra's pearls? She, that with oriental splendour she might spend on one supper an amount of wealth which could not be calculated, took off the pearls she wore, and drank them in vinegar. So say the ancient authors, who would have us believe that pearls were dissolved into a gelatinous substance; but if this may be true of pearls infused in pure acetic acid, it is not possible if they are put into potable vinegar, where they only decompose if left a very long time; whence this tradition must be considered fabulous.

The Romans, in the time of the Empire, thought so highly of pearls, that they reckoned them amongst their most precious articles to be transmitted legally to their heirs.

Often in the sales *sub asta* they bid against each other for them, so much as to increase their price enormously. They possessed an inestimable quantity of these gems taken from subdued provinces, and, nevertheless, had not sufficient to satisfy their magnificent ideas.

The commerce with Arabia increased this inordinate luxury. The interior of the Temple of Venus in Rome was adorned with pearls, and the dress of the wealthy were ornamented with them all over, even to the shoes, which made Pliny exclaim, with bitter irony, "It is not sufficient for them to wear pearls, but they must trample and walk over them."*

Alexander Severus in this respect showed com-

* Nat. Hist. IX. XXXV. 53.

mendable moderation; for, having received a gift of two very large pearls, he desired that his wife should never wear them in public. After the fall of the Roman Colossus the barbarian invaders adorned themselves with pearls, and with them also ecclesiastical ornaments were enriched.

The Greeks of Byzantium made immoderate use of them; and in this they were imitated by the inhabitants of the banks of the Danube, and by the Tartar successors of Rurik.

At the period of the revival of the arts, the discovery of Columbus brought a great supply of them to Europe, whilst the East still continued to hold her own in great estimation.

Rudolf II. of Austria exhibited a superb pearl, which weighed 180 grains.

Philip II. of Spain had a pear-shaped pearl of the size of a pigeon's egg, weighing 134 grains. It was valued at 50,000 ducats, and was called *peregrina*, or the incomparable. However, they had not yet seen that which Gougitas, a merchant of Calais, brought from India to Philip IV., which was pear-shaped, and weighed 480 grains. It is said that this king asked the merchant, "How did you venture to risk such a fortune in acquiring so small an object?" "Sire," answered the other, "because I knew there was a king in Spain who would buy it."

Leo X. bought a pearl for 80,000 crowns.

Tavernier describes one belonging to the King of Persia, which he states to have cost 1,600,000 lire.

Two Greek merchants at Moscow had one which weighed 27⅞ carats.

It is said that the King of Portugal has one as large as a pear.

In the votive crown dedicated by the Duke of Aosta to the Church of the Holy Sepulchre, and which was made by me, I put a pearl, which, similar to that sold by Gougitas to Philip IV., King of Spain, weighs about 480 grains. It is in the form of a pear, and hangs like a drop from the crown.

LXXVIII.

FALSE PEARLS.

THE beauty of the pearl, which so much enhances female loveliness, creates the desire for exact imitations at much lower prices.

Nevertheless, we do not know whether the ancients made false pearls or not.

The French claim the invention of imitating pearls for one of their citizens, named Jacquin.

We shall not dispute as to who is the author of this invention, but merely state that in Italy false pearls have been made for some centuries past, and by a method altogether different from that of the Paris bead-maker.

It is said that Jacquin being one day at Passy, observed that those small fish which we call argentine,

or silver fish, when washed in a sea-shell, left certain particles, which seemed to silver the surface.

Seeing that they much resembled the brightness of the pearl, he thought of applying them, mixed with mucilage, inside some small balls of glass. Having succeeded, he gave the strange name of *essence of the East* to his production. The argentine is a very common, white little fish, which is found abundantly in the rivers of Italy, France, and Germany. In order to extract the *essence of the East*, they are washed, while tightly compressed, in a vase of very pure water. The result is a material of silvery colour which, when taken from the water, dried and compressed, is again immersed in another vase, and after a few days the liquid is decanted and the precipitate gathered with care.

Eighteen thousand argentine yield five hundred grammes of *essence of the East.*

In order to prevent the decomposition of this animal substance, they had recourse to various chemical expedients, which for a long time remained secret to all but the inventors. Now, the most usual plan is to add ammoniacal liquid or volatile alkali to the decanted mass.

The pearls of France in glass, and those of Rome in wax, are both made of the *essence of the East;* but the process adopted in Rome differs very much from the French method, and perhaps is connected with a tradition more ancient than the invention of Jacquin.

For here the beadmakers are accustomed to make little globes of alabaster or Volterra chalk, which are then covered with very white virgin wax; over this they afterwards spread the *essence of the East*, mixed with fish glue, by which means the extract of argentine remains fixed and bright on the round surface.

The Venetian pearls are, instead, made of white glass fused into globules, within which they pour substances of various colours by means of particular processes, which, coming to us directly from the only city that preserved the tradition of ancient art, are perhaps those same which were used in the most remote antiquity.

The Lemaire pearls are balls of glass covered with a kind of varnish, composed of

3 ounces of extract of pure argentine.
½ „ vellum.
1 „ white wax.
1 „ powdered alabaster.

Many chemical compositions were proposed as substitutes for these. Barbot advises the mixture of

1 ounce of bismuth,
2 „ corrosive sublimate,

pounded separately, mixed and distilled twice. He asserts that this substance serves to imitate pearls, or to represent them in painting, with beautiful effect.

LXXIX.

PYROXENUM.

This name is given to certain substances found by Haüy, scattered in lava and in rocks of igneous origin, to which he thought them quite foreign, whence the name of *πῦρ, fire*, and *ξένος, stranger*.

For a long time they were confounded with the amphibole, with which they have in common the form of the crystal and its components, but in different proportions.

That which distinguishes the pyroxenum from the amphibole completely is its inferior brightness, its vitreous light, and, above all, its cleavage in three different planes parallel to the base.

The colours of the pyroxenum are black, dark green, white, and grey. Its most common crystals are different prisms with oblique axes; they are, however, sometimes met with in irregular octahedral prisms, more or less modified, and in pebbles either granular or of a dense substance.

All these crystals are generally small; their specific gravity is from 3·1 to 3·4, and their very variable conformation yields on analysis

Silex	48 to 52
Chalk	13 to 24
Alumina	3 to 5
Magnesia	8 to 10
Oxide of iron ..	12 to 14
Oxide of manganese ..	1 to 2

The basalt pyroxenum is of a better and brighter green than that found in lava. It easily marks glass and is translucent; it has unequal breakage and very easy cleavage.

Those found on Etna are of a bright greenish black, having a concave though imperfect breakage.

We cannot declare to a certainty whether crystals of pyroxenum existed previous to volcanic eruptions, or if they crystallized afterwards, but the first hypothesis seems the most likely. Some black varieties of pyroxenum are known by the name of *augite;* their dust is brown, and they took this name on account of their brightness, from the Greek *αὐγὴ, splendour.*

Certain green pyroxenum crystals from the Tyrol, more or less modified irregular octahedrons, received the name of *fassaiti*, because they are found in the valley of Fassa.

The *sahlite* pyroxenum, formed in crystals, is green and variegated.

The pyroxenum *diopsido*, much more rare, and found in transparent crystals of a grey-green and sometimes white, contains only lime, magnesia, and a small quantity of protoxide of iron; the double refraction which its cleavage gives caused Haüy to give it the name it bears of *δνο, two,—ὄψις, sight,*—that is, *double view*, or mineral which has two distinct characters; it bears the name of *alalite* on account of its being found crystallized in the valley of Ala, near Turin; it is dug up in lamina, in the valley of Mussa, in the same province, and thence called *mussite.*

The pyroxenum *hedenbergite*, from the name of the chemist Hedenburg, is dark-green and almost black; *it only* contains protoxide of iron, to which there is sometimes united a quantity of magnesia.

In general, pyroxenum of every quality is but little used, although well adapted for jewellery, in making ornaments for mourning.

LXXX.

PISOLITE.

This stone, which is commonly called *pisinella stone*, differs from the oolite, to which it is related, in the larger dimensions of the aggregated particles, which, in it, are composed of concentric leaves.

Like the oolite, it is composed of small spheres united by a calcareous cement, and it is found of different colours — reddish, brown, yellowish, and white.

It looks well when cut and polished. It is found in the alluvial deposits of the warm waters rising at Carlsbad, in Bohemia, and at the baths of San Filippo, in Tuscany. Its name is derived from πίσος, *pease*, λίθος, *stone*, on account of its most common colour.

LXXXI.

PLASMA.

Under this name many people understand two different stones, thinking that the ancients confounded them together and called them *prasius*.

But I think that the prasina, or *prasius* of antiquity, is not the stone which, with more propriety, we now call plasma; moreover, it appears to me they ought to be accurately distinguished.

I shall speak here of the plasma, and afterwards of the prasina, showing how this is not a variety of the plasma, and the ancients did not confound them, as it is said, one with the other, but that they indicated the plasma by a different name from the *prasius*, and perhaps by that of *molochites*.

The plasma is a semi-transparent agate, coloured green by some metallic oxide, probably copper or nickel; although often in the purest quality it approaches the colour of a fine emerald, yet it never possesses its brightness, is never pure, but always marked with little black and yellow spots.

Like the calcedony, it scratches glass deeply, and its specific gravity is from 2·58 to 2·66.

In colour it is dark olive, resinous, and semi-transparent. The extreme fineness of its texture renders it suitable for engraving.

It is found in the East and in the Black Forest. As we do not know exactly what name the ancients

gave it we cannot know where they procured it, but fine pieces, both rough and worked, are often found amongst the remains of Italian monuments.

It appears that the plasma was only used ornamentally during the time of the Lower Roman Empire, as the subjects of the ancient intagli and the quality of the execution bear witness. Contrary to my opinion, to which for the above mentioned reasons I firmly adhere, Emmanuel asserts that even the Greeks called this stone *plasma*, because its name was derived from the word πλάσμα, *image;* and Barbot, misled by the same ambiguity, says that the plasma comes only from India, and that in ancient times it was probably thence brought to wealthy Carthage, and from there to Rome.

LXXXII.

PORPHYRY.

Although porphyry is not a gem, we think it right to make some mention of it, as we did of marble, as much for the purpose of following the example of those who have written on the subject of gems as because many works of art have been executed in that material.

Porphyry is composed of a felspar rock called, scientifically, *leptinite*, mixed with crystals of ortosa and albite. The different kinds are distinguished by their ground colour, in red, green, white, brown, or black.

Their specific gravity varies, according to their aggregated substance, from 2·69 to 2·77.

The variety of porphyry most prized for its beauty, its unchangeableness, the beautiful polish it takes, for hardness and close texture, is that which was most generally adopted by the ancients, and is called *antique porphyry*. This variety is inclined to red or purple, whence the generic name of this stone, from the Greek πορφύρα, which signifies *purple*.

Red porphyry, originally from Arabia, was subsequently found in Sweden and Saxony, where it is procured of a dark colour, and sometimes blackish, mixed with grains of white. Black porphyry is that stone which the ancients called *ophite*, which is the same as *serpentine*.

The figured porphyry of Egypt, which must not be confounded with the figured marble, is most valued when it has numerous yellow marks on a white ground. That kind with a dark red ground is more common.

The green porphyry of Siberia, also found in Alvernia, shows spots or whitish grains on a greenish ground. The green porphyry of antiquity is now very rare: it is known by its long white square marks, which are in the form of St. Andrew's cross.

Italy, France, and some other countries in Europe now yield us porphyry, some of which rivals the ancient stones in hardness and beauty, but the greater part are very inferior to them. Italian porphyry, especially, is almost all very hard and scaly; the variety of a light green, on a very dark green ground, is so common that it is used in Turin to pave the streets.

The Romans and Greeks prized highly and used

largely red, green, and black porphyries, which they procured from Egypt and Arabia, and many of their sarcophagi, statues, busts, and columns composed of this stone, now adorn our museums.

Antique porphyries were often of considerable dimensions, and in proof of this we see the obelisk of Sixtus V. and the splendid columns of the church of St. Sophia of Constantinople.

In the seventeenth century porphyry was still used all over Italy.

At present porphyries are found in various regions of Europe, but, on account of their hardness, they are only used in works of art, or for utensils, as mortars, palettes, and stones for grinding colours.

In 1823 two Englishmen, named Burton and Wilkinson, discovered the great caverns which supplied porphyry to the ancients, and which are situated in a group of mountains, about twenty-five miles from the Red Sea, and called Djebel-Dokhan.

LXXXIII.

PRASE.

Prase is a diaphanous mineral, semi-transparent, and not very hard, and on account of its colour is called *prase*, or *prasina*, from the Greek *πράσον*, *leek*, because it is green as the leaves of the onion.

It takes a polish which would be perfect if it was not resinous, and which it loses in the course of time. Its colour, quite different from that of the plasma, which is rather olive, is of a decidedly emerald green.

Small and rare are the pieces of pure prase, as this stone is always mixed and marked with lime, and its internal crystallization is not homogeneous or perfect. When it presents the appearance of a regular crystal it takes the form of a prism or pyramid, having six faces of medium size; its external surface is rough and not very bright, but the breakage is scaly, concave, and of a vitreous light.

The prase in block is often formed of pieces stuck together, whose faces, somewhat rough, are obliquely lined.

This mineral, which has a specific gravity of 2·67, yields on being analysed

Silex	92·5
Alumina	0·5
Glucine	4·5
Magnesia	1·0
Oxide of iron	0·5
Oxide of nickel	1·0

The ancients believed prase to be a kind of imperfect emerald, and besides the name of *prasium*, they also called it *smaragdoprasium;* but no one has left an exact description of it; and Theophrastus, who succeeded Aristotle, made greater confusion by giving the name of *smaragdus* to every kind of green stone. This

confusion was perpetuated by rendering the Greco-Latino name of the stone common, and it was called, indifferently, *prasma*, *plasma*, or *the matrix of the emerald.*

I have explained above which is the stone that properly claims the name of plasma; that which I call prase (or prasina) is now acknowledged to be the matrix of the emerald: this can be proved by observing how the pieces anciently used, of this substance, are identical with the prase which was taken from the emeraldiferous mines of America.

Prase is still found in Saxony, Bohemia, Finland, Scotland, and Siberia.

The brittleness of the prase prevents it being engraved.

I have seen an immense number of ancient pierced "margherite" in prase, but I never saw any pieces engraved. I tried to cut some, but they broke under the trial.

LXXXIV.

QUIRITINE.

By this name Ceselli denoted a mineral composed of silex, alumina, soda, lime, protoxide of iron, and traces of magnesia; it was found by him on Mount Lazuli in 1856.

LXXXV.

RUBELLITE.

This mineral, but little known, is so called from *rubeus*, which signifies *red*, and λίθος, a stone.

It is however called *sibarite*, because found chiefly in Siberia.

The rubellite has all the properties of the tourmaline, and its colour varies from hyacinth to pink; sometimes, when shaded from the light, it seems blue.

The rubellite is found in the United States of America as well as in Siberia. Feuchtwanger speaks of one of these stones found there whose form is a perfect prism, dark red on one side, and dark green on the other; it was found in 1850, and exhibited at New York in 1853.

Such stones are also found at Chesterfield, in Massachusetts.

The Siberian rubellite cuts smooth and has often a milky-white iridized light. When transparent it is quite clear, acquires a beautiful polish, and may be called rather a valuable gem.

A rubellite, when pure and of a perfect colour, may be worth as much as 7,000 lire.

Those found in Maine are rare.

It has been thought by some that the rubellite is the *lyncurium* of the ancients, but their properties are not similar.

We have rubellites which are certainly antique, but none of them are found engraved.

LXXXVI.

RUBY.

By this name, which comes from the appellative of *rubeus*, on account of their colour, three gems are known, very different in their constitution, but resembling each other in colour so as often to be confounded together; they are the red corundum or Oriental ruby, the red spinel, and the balais. We shall treat of them separately.

1. ORIENTAL RUBY.

The gem most prized next to the diamond is the ruby, or red corundum of the naturalists.

The splendour of its tints, sometimes purely red, at other times violet, pink, or purple, makes it the most beautiful coloured gem in nature.

The hardness of the Oriental ruby is immediately second to that of the diamond, and it is superior to that of the other corundums.

It has double refraction, although not of a high degree; its light is vitreous; it bears the strongest fire without losing colour or form, but by means of a special solvent it is transformed with difficulty into a clear glass.

It is easily perceived from its crystals that it has experienced the action of fire, but, notwithstanding, they are capable of cleavage. Their form is not well defined, generally oval and imperfect, but still octagonal or round, or flattened at one part.

The specific gravity of the Oriental ruby, greater than that of all other gems, is from 3·900 to 4·2833.

When analysed it yields

Alumina	98·5
Oxide of iron	1·0
Remainder	0·5

When rubbed it becomes electric, and remains so for a considerable time.

The best Oriental rubies come from China and India. They are found in the island of Ceylon, in the mountains of Capelan, in Pegù, ten days' journey from Syrian, at Cambaja, and at Lahore. Those from China are procured in the mountains of the province of Ya-nan.

The mines of Burmah, which produce the best, have been known for many centuries. Being a government monopoly, they are rigorously guarded, and no European can even see them. It is said that the king of that country possesses some of the most beautiful, and he numbers amongst his titles that of *Lord of the Rubies.*

When the superintendent in those mines sends notice to the Court of the discovery of an extraordinary gem, the king orders an immense and sumptuous procession of soldiers, lords, and elephants to go and take it.

The rubies of Ceylon, which are those most prized, are gathered on the shore of a river which flows to Sittivacca.

The red corundums of Australia, hitherto found, are of a bad quality. None have yet been found in America.

An Oriental ruby may be considered fine when neither too light nor too dark, but precisely of that colour which we call pigeon's blood.

It is cut on a wheel covered with diamond dust.

Emmanuel asserts that rubies of the finest colour, of less than one carat in weight, are worth from 50 to 200 lire the carat; that those weighing upwards of four carats have no determined price, and for the others he gives the following table:

1	carat	from	350 to	500 lire.
$1\frac{4}{8}$		,,	625 to	900 ,,
2		,,	1,750 to	2,000 ,,
3		,,	5,000 to	6,250 ,,
4		,,	10,000 to	11,500 ,,

He adds, that pale, blackish, violet, and split rubies are common, and of little value. Those which are red asterias are prized on account of their rarity.

The ancients gave many names to this beautiful gem.

Marbodio called it *granaticus*, from its colour being similar to that of the pomegranate.

Marbodius named it *Antrax*, which signifies *burning carbon*, because of the vivid rays it emits when struck by the sun. In describing it, he asserts that a very small gem of this kind was sold for a sum equivalent to one thousand lire.

Pliny describes them by the name of carbuncle, or "*carbunculi a similitudine ignis appellati.*"

Amongst the many varieties, he places *carbunculi*

acausti and *apiroti* "*cum ipsi non sentiant ignes*," which properties perfectly suit the red corundum.

He, according to the ancient custom, divides the masculine, which is bright and resplendent, from the feminine, which is pale and less bright: "*Fœminæ languidius refulgentes.*"

It is said that preference is given to the Indian rubies, amongst which those are retained as best which, from the extreme vivacity of red, incline to amethystine violet: "*optimiores . . . . quorum extremus igniculus in ametysti violam exeat.*" As these are the finest now seen, they are denominated *amethystizonti.*

In the second rank as to value, they place the "*sirtiti pinnato fulgore radiantes*," and give the name of *lithyzonthi* to the dark, pale, and discoloured Indian stones.

We conclude that it is most difficult to distinguish the different kind of carbuncles when set, as it is still usual, at the present time, to modify the tint, by placing under it a coloured substance, which can impart brightness and beauty to a gem naturally pale and dull: "*nec est aliud difficilius quam discernere hæc genera, tanta est in eis occasio artis subditis per quæ translucere cogantur.*"

As in the case of other gems, the ancients used to make even false rubies in red glass. King says, he saw one beautifully engraved with a head of Medusa, so well imitated that he could not at first declare whether it was gem or glass; even the flaws of an imperfect gem were imitated in it; and Pliny asserts

that, in his time, carbuncles were made of glass so like the real that it was only possible to know the difference by the hardness.

In some ancient jewels, as in Eastern ornaments, rubies are seen very roughly worked, but well polished and pierced from side to side, with grave injury to the beauty of the gem.

In the Hertz collection there was a necklace composed of rubies and rough emeralds of excellent quality and colour, and of the size of small beans, pierced and strongly fastened together with a golden thread.

I have never yet seen Oriental rubies engraved which could with certainty be called antique.

I have tried many times to have some engraved, but, in spite of the best efforts of skilled artificers, the results were but mediocre.

Wherefore, Lessing, a scientific German, and the Count de Clarac, a French archæologian, having, as the result of their long experience, declared as generally modern all the intagli on corundums which were asserted by others to be antique, I adhere to their authoritative opinion with regard to the Oriental ruby.

2. SPINEL RUBY.

The spinel is an anhydrous aluminate, having a base of magnesia, zinc, and iron, crystallized in regular octahedrons differently modified, and sometimes in tetrahedrons.

In general, the planes of its crystal are more regular

than those of the corundum, from which it differs in its composition only by having a lesser quantity of alumina.

It has single refraction like the diamond. It marks quartz, but is marked by the corundum. It acquires electricity by friction; does not melt under the action of the blow-pipe, and in contact with acids does not alter in the least.

Its specific gravity is 3·7; its hardness, 7·56. It is coloured by chromic acid.

The spinel is always found with the corundum, and it appears that both are produced by the same cause.

The spinel is of various colours; and in that section of the mineralogical cabinet of the Roman university where the collection of the illustrious Conte Lavinio Spada Medici is arranged above fifty different kinds of spinelle, belonging to this eminent cultivator of mineralogical science, are to be seen; there are some perfectly white and clear, reddish-white, pale rose, and passing through all shades of wine-red till they reach blackish-red.

They are found in violet of every gradation of tint. In Greenland and at Vesuvius they are found of amethyst colour. At Aker, in Sweden, as also at Straskan, in Moravia, are found spinels of a blue colour, but not transparent.

The ferriferous spinel, Cingalese, or black spinel, a variety which is very small, bright, and black, is found in the lava of the Somma, in the lands of Val

di Fassa, in the Tyrol, in Bohemia, in the island of Ceylon, and in many parts of South America; and are called *pleonasto*, from the Greek, which means *very abundant*.

The zinciferous spinel, also called automalite or gahnite, is an alumina of greenish or greyish zinc, generally opaque. Up to the present time it has only been found in Switzerland, and near the city of Franklin, in South America.

White spinel is procured from Mount Laziali.

Berzelius asserts that when the spinel is heated, it first takes a dark tint, then becomes black, afterwards opaque, but on cooling it changes colour and becomes of a limpid green, from which it gradually returns to its natural colour.

The finest of the spinels is that which bears the additional name of ruby, because red; it is like the Oriental ruby, although its lively tint tends a little to yellow, yet not so much as the jacinth and garnet. Its chemical composition is

Alumina	69·01
Magnesia	26·21
Protoxide of iron ..	0·71
Oxide of chrome ..	1·10
Silex	2·02

The other varieties differ in the proportion of their component parts; and in some by the mixture of other substances.

Many spinel rubies are fraudulently sold as Oriental

rubies, but the deceit is easily discovered by the differing hardness and the specific gravity.

We do not know the name by which the ancients indicated the different varieties of spinel; only, in my opinion, it may be asserted that the red or ruby spinel was described by Pliny under the name of alabandic carbuncle, *carbunculus alabandicus*, because, in speaking of carbuncles in general, he affirms, "Alabandicos cæteris nigriores esse;" that is, to have a darker colour, and this is the case with the spinel ruby. It is said to be procured in Ortosia, and cut in Alabanda, whence the name given to them.

3. BALAIS RUBY.

By balais is meant a ruby of a lighter colour than the spinel, rather tending to pink, and whose specific gravity is never more than 3·446. It is even less hard than the spinel ruby, and contains a greater quantity of magnesia.

The balais is more easily scratched by the emerald than the emerald is by the rock-crystal. It will take a beautiful polish, but only as the result of much patience, and the use of a special chemical composition on the wheel when being worked. Caire is convinced that in India they have, for this purpose, a secret specific, as balais are brought thence scarcely out of the original form, yet having a beautiful artificial light.

Neither balais nor spinels have ever been seen having the qualities of the asteria.

The balais is often found in large crystals; and if that is true which we read in the history of the Grecian empire in the dark ages, there were seen some of enormous dimensions; and one of the Cantacuzeni, emperor of Constantinople, had given ten balais rubies, weighing each eight ounces, to the Venetians, in the year 1343.

Pliny says that, amongst burning stones, the chalcedony and lichnite alone were found large enough to permit of their being made into cups; and in describing the lichnite he thus expresses himself: "Of the same species is the lichnite, so called because it shines brightly by lamp-light. It is procured in the neighbourhood of Ortosia, and all over Caria and its vicinity; but the most beautiful comes from India, and it is said by some to be a carbuncle of minor brightness. When warmed in the sun, or rubbed between the fingers, it attracts straws."

From this description, King concludes that the lichnite is an Oriental ruby; and in confirmation of his opinion, he repeats a passage of Solinus, who says the lichnite is thus called because it shines much by lamp-light, is transparent, very bright, attracts straws when warmed in the sun, or rubbed; is not easily cut, and is of no use for seals, as it repels wax as if bitten by it: *velut quodam animalis morsu.*

However, it seems to me that this description, and also that of Pliny, agree in general more with the balais than with the corundum.

It is true that the balais and spinel can be very

well engraved by the tool, but how could this have been done by the ancients? Besides, did they ever find clear corundums of sufficient size to make cups? "*Potoria vasa et ex hoc lapide et ex lichnite factitata invenio.*"

Therefore, I believe the lichnite to be rather our balais than the Oriental ruby.

In the dark ages this name was given it through the Greek rendering of Balassus, or Palassus, because it was supposed to be the bark or house in which the true ruby resided; and Andrea Braccio says, explicitly, that "The name of balais comes from the word *palatium*, because it is supposed to be the matrix or palace in which the ruby is found."

Emmanuel believes, on the contrary, that this name had its origin from the province of Asia now called Beloochistan, and anciently Badakschan or Balaschan. Emmanuel makes the same observation as Sebaldo Savio: "*Nomen ejus belashsch diciturque a Teifaschio adduci ex Balashchane, quam regionem barbari Badachschan vocant, estque secundum eum pars terræ Turcarum quæ ad Tartarium vergit.*" And he goes on to assert that even at the present day this gem is called Badakschiani, in Persia.

A Persian tradition holds that the balais remained unknown until the occurrence of an earthquake, which, by dividing the mountain in which it had been concealed, discovered and offered it to human rapacity.

Marco Polo, in the description of his voyages, tells

us that this gem is found principally in certain mountains called *Shekinim*.

One of the finest balais known was in possession of the King of Oude. On it was engraved the name of one *Julal-u-dín*, and from this it took the name at court of *Lal-i-ja'adi*. It was the size of a walnut, and very brilliant.

In the middle ages it was thought that the balais and the red corundum had certain occult and supernatural virtues. Eliano relates how a stork, having broken a leg, was cured by an old woman named Eraclide; he afterwards flew away, and returning, placed in her bosom a very fine balais which he carried in his bill, and gave to her as a token of gratitude.

The balais is easily cut on the wheel, as already remarked; and I have seen many of them engraved, but none that I could, with certainty, say were of antique workmanship.

LXXXVII.

SARD.

Sard is that stone which is generally called *sardonica*, to distinguish it from sard-onyx, of which we shall speak presently.

The sard, then, calling it by the name bestowed on it by the Romans, is an agate-quartz of a dark colour, between red and yellow.

Consisting of the same components as the carnelian, it only differs from it in colour and fineness of texture.

Its specific gravity is equal to 2·603.

When looked at against the light it is transparent, and appears more yellow than red; otherwise, its colour is more that of dark marone. Nevertheless, it is found of varied tints, from blackish-red to light chesnut.

The beauty of the sard as used for engraving consists in the purity and evenness of colour, when looked at through the light.

When a sard is very hard, it takes the name of *Oriental sard*, in accordance with the term applied to the most precious stones.

This agate is brought from India, Arabia, Egypt and Armenia.

Bohemia and Silesia also yield us sards, but they are much inferior. Engravers despise them on account of their smoke-coloured tint, sprinkled with bluish spots.

In substance the sard appears to resemble the plasma very much, excepting in the colour.

Scipio Africanus is the first of whom it is related that he continually wore a sard ring on his finger: this is told us by Demostrato.

The origin of its name is disputed. Pliny believes it to be that this stone was originally found near Sardis, chief city of Lydia. He says, however, that very beautiful sards are found on the mountains of Maranaï, near Babylon, and on the confines of Egypt.

Others think that this name is derived from Sardinia; but Cesio and St. Epiphanius maintain that it is

called sard on account of its colour, which much resembles that of the flesh which adheres to the backbone of the dried and salted sardine.

The sard was, and is, much used in works of art, or in engravings. The most celebrated engravers prefer the quality called *sandy*, which is of a beautiful colour, but sprinkled with small opaque spots of a darker shade. At the present day it has become precious from its rarity.

The most beautiful intagli known on sard are, Mars and Venus surprised by the gods, a group of nine figures, attributed to Vincenzo Belli, of Vicenza, and which belonged to the Orleans collection; and the nuptials of Cupid and Psyche, cut by Trifone, and mentioned by Stosch, who saw this engraved gem in London.

LXXXVIII.

SARD-AGATE.

This is a sard which has an upper stratum of white agate, and is perfectly similar to the onyx in appearance.

Caire and other authors thought they could substitute for the ancient name that of agate carnelian; but it does not exactly express the nature of the stone, and therefore the other remains.

The finest specimens have one stratum in sard and the other in white agate. The scarceness of the best kind makes them valuable.

In this well-known stone there is a cameo belonging to the Genevosio collection, of Turin, which represents the Medicean Venus; it is as large as the stones generally worn in rings, and the artist had the cleverness to cut it on the reverse side; thus, on the white crystalline ground of the agate, he has admirably raised the form of the goddess of Love, in sard, which from its colour has a very beautiful effect.

LXXXIX.

SARDONYX.

The ancients called this stone *sarda-onyx*. In this beautiful quartz are found, mixed in strata, the substances of the sard properly so called, and of some, or many kinds of agate; that is to say, of the chalcedony, jasper, carnelian, and such like; from this arises an enormous variety of colours, which, being mostly arranged in zones or regular lines, allow the artist to make the finest and most valued camei in sard-onyx.

One of these stones, even without being cut, may be worth as much as two thousand lire, a price to which neither the sard or sard-agate ever reaches; it differs from this last by the multiplicity of strata, or, when it has but two, by the opacity of the upper one.

The most remarkable cameo now existing in sardonyx is in the Vienna cabinet; it is attributed to Dioscoride.

Although composed of but two strata, of which the one that forms the ground is of the finest sard, while the other, which is the relievo, is chalcedony, it may be said to be, if not the finest, at least amongst the most rare of the true antiques which have great artistic merit. It is 0·187 m. long and 0·217 wide. It belonged to Philip the Fair, King of France, who gave it as a gift to the monastery of Poissy, whence it was stolen, during the religious wars that devastated France in the last century, and taken to Germany; Rodolph II. there purchased it for the sum of 12,000 gold ducats, and placed it in the imperial cabinet. It represents, with twenty figures, the apotheosis of the Emperor Augustus.

XC.

EMERALD.

This is a splendid and transparent gem, of a green colour, from the lightest to the darkest shade.

It appears that its name has the same root in many languages; as in Arab it is *zamarut;* in Chaldaic, *ismaragdon;* in Greek, *smaragdos;* in Latin, *smaragdus;* in Spanish, *esmeraldo;* and in French, *émeraude.*

It is said to be derived from the Sanscrit *smarakato,* which means *green;* or from the Greek word *ἀμαρύσσω, to shine* or *lighten.*

The emerald, like other gems, is divided into Oriental and Western. The most rare Oriental emerald is nothing but a clear green corundum.

This variety of corundum is very remarkable in being softer than the red and blue stones, and it would seem that the glucine which enters into its composition is the cause.

It crystallizes in regular prisms having six faces, besides which may be seen various truncations; its cleavage is straight and quadruple, which property makes it easily distinguishable from other emeralds which have no cleavage. All Oriental emeralds have not the same degree of hardness; their specific gravity, although it may differ from that of other corundums, yet in the hardest varieties often amounts to 3·01.

The perfect corundum is of an herbaceous green, more or less dark, which by its silken light reposes and renews the sight. When analysed, it generally yields

Silex	64·05
Alumina	15·00
Glucine	13·00
Oxide of chrome ..	8·25
Lime	1·06
Water	2·00

Sometimes it gives in the residue a little oxide of iron. There were caverns of it in the island of Ceylon, at a place called Matoüla, but now they seem exhausted; even there they were seldom found in large crystals.

This gem, when perfect and weighing more than two carats, is as valuable as the diamond.

Between the emerald corundum and the Western emerald of fine quality there is the same difference as between the perfect red corundum and the perfect spinel.

The Western emerald is a silicate of alumina, almost identical in its composition with the beryl or aquamarine.

It is the least hard amongst gems, and therefore breaks easily.

It crystallizes in truncated hexagonal prisms at the two extremities; its crystals lie between the composite rocks and argillaceous schists, and also in the accidental cavities which occur in granite blocks.

Sometimes it is found united with crystals of quartz, mica, and felspar. It is, moreover, procured from sulphuretted iron, in carbonate of lime, and in sulphuretted lime.

This emerald has a vitreous and seldom a resinous light. It is soft when just taken from the mine, but hardens in the open air.

Its specific gravity is between 2·73 and 2·76. Its hardness between 7·05 and 8. It yields a white powder. It becomes electric by friction. It melts under the action of the blow-pipe, forming a limpid vesiculated glass of the consistency of borax. When calcined and still hot, if thrown into water, it breaks into fragments of various colours.

It gives, on analysis,

Silex	68·50
Alumina	15·75
Glucine	12·50
Protoxide of iron ..	1·00
Earth	0·25
Oxide of chrome ..	0·30
Magnesia	Traces.
Soda	Traces.

It is not corroded by acids, but is soluble in salts of phosphorus. It is found in micaceous schists at Salzburg, in the mountains of Sahara, in the argillaceous earths of Peru and of Siberia, at Henbachthal, in Germany, at the height of 8,700 feet above the level of the sea.

The Western emerald is now procured principally from America, where the mines of Muzo, in New Granada, are celebrated.

Emeralds of very good quality are dug up at Odontchelong, in Siberia, and at Ava, in India.

This gem has often imperfections and flaws inside which quite deprive it of its lustre; there are some, too, very opaque.

It has been thought that the green colour of the emerald is derived from oxide of chrome; but Levy, in the analysis, perceiving such a small quantity of chromic acid, formed the opinion that it was produced by some organic substance, which he imagined was a carburet of hydrogen similar to the chlorophyll which colours the leaves of plants.

A great number of emeralds are seen in the precious ornaments of every age, as often in their natural crystalline forms, simply pierced, as cut in different shapes. But under the name of *smaragdus*, all green stones are generally understood; and so, the emerald, jade, jasper, malachite, plasma and prasina were confused together, and about twelve varieties of smaragdus were thus described.

Theophrastus, in describing the emerald, distinguishes it, nevertheless, from jasper and from other stones of minor value. "The emerald" (he says) "possesses some particular virtues; it imparts its colour to water when dipped in it. It also rests the eyes."

After him, Pliny wrote: "The third place is given to emeralds, for many reasons. There is no colour which gives more pleasure to the sight than this; for we view leaves and grass with delight, but emeralds with so much more, as nothing, however green, can be compared with them in intensity of colour. Besides this, they are the only gems that fill the eye, without fatiguing it; and, moreover, when the sight is wearied, the emerald restores and relieves it; and for gem-engravers no other means of refreshing the eye is so agreeable as its beautiful green colour. Those of Scythia are the best—none are harder or with less defect (*nullis major austeritas aut minus vitii*). And in the same proportion that emeralds differ from other gems, the Scythian differ from other emeralds. . . . After the Scythian, come those from Bactriana. The Egyptian stones hold the third rank, and are found at

Coptos, a city of the Thebaïd. Other kinds are found in copper mines."

After all that has been said, it appears to me that we should not hold as truth the statements of many old authors, and among them Tavernier, who assert that the ancients had no knowledge of the emerald, and that it was first brought by the Spaniards from America to Asia and Europe, in times not very remote from ours. The Greeks and Romans then had their precious emeralds from India, Bactriana and Egypt.

In Upper Egypt there is a chain of mountains, not far from the city of Asna, where there are some places still called the mines of emerald. By order of the Viceroy, the French traveller Cailloud explored those places and found there some old mines; there were houses and tools abandoned, in all probability, in the second century A.D. Wilkinson afterwards discovered extensive caverns, also, on Mount Zahara, and there picked up emeralds similar to the ancient Greek and Roman gems, that is, inferior to those from America and India.

The emerald continued to be used in precious ornaments even in the darkest times of barbarism.

The iron crown which Theolinda gave in the sixth century to the cathedral of Mouza had many emeralds mixed with its rubies and sapphires. There were some in the crown of Agilulfo, restored by the celebrated Anguillotto Braccioforte in the fourteenth century, and therefore many years before the birth of Columbus.

There were emeralds in the cross of Lothairius, a

work of the ninth century, and in the celebrated crown of St. Stephen of Hungary, made in the tenth.

There was a very fine emerald in the tiara of Julius II., who died in 1513, thirty-two years before the discovery of Peru. And, finally, Benvenuto Cellini, when speaking of the antique gems which he bought from the country-people of Rome, describes an emerald with an engraving, said to be antique, representing the head of a horse.

The discovery of America really furnished all Europe with a great quantity of those gems which of all the Western stones are the most beautiful.

When Pizarro conquered Peru, he went as far as Calcamalca, a considerable city, whose chief offered him many gold and silver vases, with a quantity of large emeralds, which had probably been obtained from the mines of Warta. But this did not satisfy the cupidity of the invaders, who forcibly took the treasures which for ages had been accumulating in the principal temple of that empire. Amongst the rest, they got a great number of these gems, as the priests persuaded the people that the goddess Esmeralda, to whom the temple was dedicated, dwelt in an emerald the size of an ostrich egg, and that no offering was more acceptable to her than these stones.

The price of emeralds is very variable, depending on the size, colour and clearness.

A very pure and perfect Oriental emerald, of six carats, may be worth 10,000 lire; and there are some of more than fifty carats, which are not worth more

than 10 lire the carat. It is believed that in the treasury of Loreto there is still a quantity of emerald crystals, which being naturally united together, are of the size of a human head. They were dedicated there to the Virgin, by the miners of Peru, represented by the Marquis of Aragon, then ambassador from Spain to Rome.

It is said that in the imperial treasury of Vienna there is an emerald which weighs 2,205 carats and is valued at 300,000 gold crowns. In a work entitled 'Memoires du Règne de Catherine II.,' it is asserted that there is an emerald belonging to the Russian crown as large as a hen's egg. The finest emerald known is in the imperial cabinet of St. Petersburg; it weighs 30 carats; its colour and clearness are perfect.

I saw, with the Count Lavinio Spada, a natural emerald which came from Peru; it was of a beautiful colour, and was ten centimetres long and about five wide.

It is said that Dhuleep Singh has a very perfect emerald about five centimetres long, three in width, and two in height.

The Duke of Devonshire has one which weighs nine ounces.

Beautiful engravings on emerald are made, notwithstanding the fragility of the material. Ismenia, an ancient Italian musician, is said to have had one representing Amimone, daughter of Diana; Gorlee, of Antwerp, published the illustration of a large oval emerald

on which is represented, with three figures, the soul carried away by pleasures.

The ancients dedicated this gem to Mercury, and believed that it had the peculiar virtue of preserving the sight if worn in a ring, of alleviating the pains of parturition, and of being an infallible talisman for preserving chastity.

When reduced to powder, six grains of it were swallowed as a noble remedy for various maladies.

According to Ebelman, Western emeralds could be manufactured by melting a mixture of

Silex	7·00
Alumina	1·60
Glucine	1·40
Boracic acid, fused ..	4·06
Oxide of chrome ..	0·10

From this results a green crystal, having a specific gravity of 2·73 to 2·77, which can be marked by an English file, but deeply marks common white crystal and the softer kinds of quartz.

XCI.

EMERY.

A MINERAL substance whose name is derived from σμύρις, a word by which the Greeks meant the stone used by lapidaries in cutting gems.

It is divided, like those, into Oriental and Western.

Oriental emery is nothing but granular corundum, that is, an aluminate whose specific gravity is 4, and which, when analysed, yields

Alumina	86
Silex	3
Iron	4
Waste	7

By some it is called *adamantine spar*, and is found in China, Bengal, and Ceylon in large octahedrons, which, under a given angle of luminous rays, reflect bluish light, but are generally opaque.

The best comes from China, and contains more oxidized iron than that from Bengal. When pulverised, it scratches some gems, but not the diamond.

The Western granular corundum, or Western emery, is rarely found in crystals; it is more frequently disseminated in grains, like sand.

Although excessively hard, it is less so than the Oriental. Its colour is black grey, reddish grey, or bluish grey. It is seldom transparent, yet some of its very fine particles shine brightly.

The Western emery, which must not be confounded with the granite, magnetic iron, and the compact red hematite, is found in Italy, Germany, and Spain, at Smyrna, in the island of Nasso, at Jersey and Guernsey. That kind which is found in Saxony lies between the strata of mica and steatite. It is united with a great quantity of iron, from which cause it is often attracted by the magnetic needle.

Emery is most useful in all arts connected with glass, stone, and metal work. It can be reduced into exceedingly fine powder, and when used it is first melted in water, oil, diluted sulphuric acid, or in vinegar. It is often used spread and glued over a strong, stiff card-paper. It is impossible to judge at first sight the quality of an emery. Certain kinds would not do to work stones of medium hardness, being too large in grain. It is remarkable that these are useful in cutting harder stones, and this happens because the grains are then crushed by the hardness of the stone, and reduced to the finest powder.

XCII.

SPUMA-MARINA.

Hydro-silicate of magnesia found in nodules, in various countries, and bearing the above name, from the German word *meerschaum*, which signifies *froth of the sea*, because the German labourers who gather it in the Baltic provinces believed that it was produced by the waters of the ocean.

XCIII.

STALACTITE.

This name is given to certain calcareous spars in the form of cones, pillars, and columns.

They have a fibrous breakage; are translucent, of a white or yellowish-white colour, and a smooth or tubercular surface.

When water loaded with calcareous matter filters in a cavern, the first drops that drip from the roof leave, after evaporation, a small ring of solid substance, which, by the successive addition of fresh drops, increases in size, while gradually forming a kind of jutting cylinder. Each following drop depositing on the sides of the little cylinder additional solid matter, increases it by degrees, and especially on the upper part, where the drops remain longer, and thus it takes the form of a reversed cone.

The watery part which falls from the stalactite on the ground is not totally deprived of calcareous substances, and therefore is not entirely absorbed, but leaves a deposit which rises in the form of an upright cone, and is called stalagmite. Thus the two cones, always increasing in the same line, frequently join together and form columns, which seem placed there for the support of the roof.

If the water, impregnated with calcareous substances, glides slowly over the walls of a grotto, it leaves deposits arranged in festoons or disposed in drapery of most varied form, and these are distinguished from other stalactites by the name of ‘ drapery configurations.’

Stalactites, stalagmites, and these festoons, are seen in many caverns and natural grottoes both in the old and new world. The most celebrated are those of Antiparos, of Collepardo, of Bauman, and of Monsummano.

The substance composing stalactites is worked like alabaster, and made into vases, cups, and other little articles.

XCIV.

TOURMALINE.

A GEM remarkable amongst all others on account of its electric qualities.

Tourmaline is often found amongst antique jewellery, but we do not know what name the ancients gave to this stone, of which no description remains relative to its physical properties. Equally ignorant are we as to the etymology of its name, which, nevertheless, seems to have come to us from India.

In 1717 some German travellers found it at Ceylon and brought it to Europe, calling it *ascentrekker*, because it especially attracted or repelled ashes.

In 1758 an Italian, the Duke of Najo Caraffa, procured two in Amsterdam, which he presented to the celebrated Buffon, who was the first to give a scientific description of them.

Then they received the name of *electric sciorlo*, from the German *sciorl*, derived from Shorlaw, a Saxon village, in whose environs it was abundantly found. But the term *sciorlo* is now only applied to the black kind, the others being called tourmaline.

Tourmaline is found crystallized in pebbles of different forms. The crystals are rhomboidal, and

sometimes very large. It is unequally opaque and semi-transparent. It has vitreous light, and is of all colours of the prism in all their gradations. It cuts quartz, but is cut by the topaz. It gives a white powder. Its breakage is concave and imperfect.

Its specific gravity is from 2·99 to 3·33. It has double refraction and great power in polarizing light, which power increases when it is heated. Under the action of the blow-pipe it swells without melting, while its thin extremities vitrify. United with borax, it easily reduces into a clear and vitreous substance.

Tourmaline cut into plates is used in the polaroscope to ascertain the optical properties of other substances. The analyses made of this gem are many and complicated, and amongst these the following is the most simple; it is of the red tourmaline:

Silex	..	..	.. 43
Alumina	..	..	.. 47
Soda	..	..	.. 10

Tourmaline is found of all colours, and many of them have a great resemblance to the more precious stones, such as the ruby, emerald, and similar.

XCV.

TOPAZ.

THE topaz, like other gems, is divided into two kinds, viz., the Oriental and Western.

The Oriental topaz is a clear, coloured corundum, of a very bright golden-yellow colour, having a specific gravity of 4. It has double refraction, although in a small degree. It is found in crystals, which are generally round, like those of other corundums, but sometimes it shows its primitive form, which is a quadrangular prism.

Its hardness equals that of other corundums. It is found at Peru, Ceylon, and in various other parts of India.

With respect to value, it never equals the ruby, sapphire, and emerald. Sometimes it contains little grains which shine like those of the aventurine, but these rather diminish than increase its value.

There is a beautiful topaz in the mineralogical cabinet of Paris 0·023 mètres long, and 0·014 mètres wide.

The Western topaz is divided into four different kinds, viz., Brazilian, Saxon, Mexican, and Siberian.

The Brazilian topaz, which is now most valued next to the Oriental, is generally of a fine, clear deep yellow; it has such a particular appearance that it is easily recognizable.

One of its physical qualities, by which its nature may even better be determined is, that when somewhat heated it acquires electricity, which it preserves sometimes for thirty hours.

It cuts rock crystal deeply, and its specific weight is 3·52. The most extraordinary of its peculiarities is that of changing colour from yellow to a pink shade when warmed to a certain temperature. This discovery

was made by Damelle in 1750. The rough topaz of Brazil is worth from two to one hundred lire the kilogramme, according to colour and purity.

The Saxony topaz is generally of a pale yellow; some have considerable brightness, but these are rare. It changes colour when warmed, then becomes white, but when again cool it resumes its first tint. It is found at Schnaknistein, in the valley of Daneberg. It has no value unless it be very large and very beautiful. The Mexican topaz, which in the two last centuries was called Indian topaz, is almost the same as that of Saxony, only it is more varied in its tints.

There is a fine, very clear Siberian topaz, in colour similar to the yellow of the jonquil. Those which are of the aquamarine colour, and are very common, ought not, according to the general opinion, to be reckoned amongst topazes. These various kinds, when analysed, gave

	Brazilian.	Saxony.	Siberia.
Alumina ..	58·38	57·45	59
Silex	34·01	34·24	35
Fluoric acid ..	7·79	7·54	5

We have already observed that the stone called topaz by the ancients is not the topaz of modern times.

But if we clearly explained, that to them the *chrysolitus* was what is now the modern topaz, we did not declare that our chrysolite and the peridot were their topaz.

Pliny says, "In our days the green kind of topaz

(*in suo virenti genere*) is greatly prized . . . since it is always compared to the juice of the leek . . . and it is one of the noble stones which bears the file."*

It is said that its name is derived from *topazein*, which word, according to him, signifies, in the Troglodyte tongue, *to seek;* "because" (he continues) "Juba writes that Topazos is an island of the Red Sea, which, being surrounded by fogs, often requires to be *sought out* by navigators, whence its name."†

We receive it then as a fact that the descriptions handed down to us from the ancients of the stone called topaz by them refer to the modern chrysolite; and all they say of the chrysolite, or golden stone, concerns the modern topaz. I have never seen an intaglio on this stone which could with certainty be called antique. In fact, the topaz, on which is engraved an Indian Bacchus, which came from the Vatican and is preserved in Paris, seems, from the description given of it by Barbot, to have been cut in the seventeenth century. They have also on other topazes the likeness of Philip II. and of Don Carlos, the work of Giacomo da Trezzo, who lived in the sixteenth century. Caire had an Oriental topaz pierced which weighed twenty-nine carats, and on which was cut in Arab letters the little verse, "God alone will finish it." This was probably one of the amulets called by the Arabs *gri-gri*.

* See 'Chrysolite,' page 7.

† 'Nat. Hist.' xxxvii. viii. 32.

XCVI.

TRIPOLI.

This mineral substance is not a gem, although necessary to the working of gems; and therefore all treatises which have mentioned it, have spoken very briefly of it.

By the ancients it was called stone of Samos.

The name which we give to it now comes from the city of Tripoli, whence it was procured before being found in Europe.

It is used principally in giving the last polish to precious stones, and it is useful besides to engravers, opticians, workers in precious metals, gun-makers, and varnishers.

It appears that tripoli is a schist or a clay. It is found more or less calcined, and mixed with other schists and clay. On this account it has different degrees of hardness.

Analysed by Hasse, it gave

Silex	90
Alumina	7
Iron	3

Barbary tripoli comes in commerce in small pieces. That from Polinier, a country near Pompean, and four leagues from Rennes, in France, is harder, and therefore more in request by the polishers of precious stones. The white kind is preferred, because it is seldom granular.

In France it is found in a cavern near Menat, in Alvernia. Bomarè says that there the banks of this substance are arranged from east to west, and covered with 3,898 mètres of earth. He adds that tripoli found there is rather soft, but hardens by contact with the air.

XCVII.

TURQUOISE.

The Venetians, who were the first to bring this gem into Europe from Turkey, called it *turchesa*, and afterwards *turquina*. Turquoise is of three kinds, viz., aluminous Oriental turquoise, fossil or osseous Oriental turquoise, and Western turquoise.

The aluminous Oriental turquoise is found in the alluvial lands of India and Persia in globules disposed in lines, or in small fragments. It is of a beautiful sky blue colour, sometimes slightly spotted with green. It is less hard than quartz, but scratches glass, and yields to a good steel file. Nothwithstanding its opacity, it takes a beautiful polish.

It is insoluble in azotic acid; and thus it is easily distinguishable from the other kinds. Its specific weight is 3·127. On analysis it gives

Alumina	73
Oxide of copper	4·5
Oxide of iron	4
Water	18

Fine turquoises of this kind are of a most charming light blue colour, clear and even, at least on one side. It is very rare in large pieces, and therefore of high price.

The Oriental fossil turquoise is an osseous animal substance, coloured by oxides of iron and copper, petrified by calcareous filtrations.

This turquoise is of a blue colour slightly tending to green, and having a smooth surface. It scratches crystal weakly, and resists acids almost like the aluminous species.

On analysis it yields

Phosphate of lime	80
Carbonate of lime	8
Phosphate of iron	2
Phosphate of magnesia ..	2
Phosphate of manganese ..	Traces.

The Western turquoises are also osseous substances, generally the teeth of animals, but in a natural state, and not petrified. They are coloured by oxide of copper, and are more likely than the others to discolour under the influence of the air.

They lose their colour in distilled water, and dissolve under the action of acids, especially of aquafortis.

It is commonly believed that in certain cases every turquoise loses its fine colour. In the middle ages it was asserted that the turquoise grew pale on the finger of a sickly person, but that it regained its colour on the hand of a perfectly healthy person. Others asserted that its colour varied with the hours of

the day, and insisted that an attentive observer might use it as a sundial. In Germany even now it is believed that, when offered as a love gift, it remains unchanged while love lasts, but loses its colour when affection declines. But if the colour of the Western and that of the fossil Oriental turquoise change, it is not so with the aluminous turquoise, which always remains the same.

Fossil turquoises change colour only on the surface, so that they can regain it by means of the wheel.

Not so with the Western turquoises, which, changing altogether, can only for some days be made to regain their lost colour by dipping them in a solution of oxide of copper. They are then called *bathed turquoise*, and are of very little value.

Some people think that the turquoise is the stone which the ancients called *callais*, and is thus described by Pliny: "The callais grows in the islands of Mount Caucasus, but is spongy and full of spots: that from Caramania is clearer and better. In both places it is found in inaccessible and cold banks protruding in the form of an eye, which does not appear to have been produced in the stone, but fastened on it. It can be cut and worked, but is fragile. When set in gold, no jewel looks so well. The handsomest lose their colour in oil, grease, or wine; the worst preserve theirs best. No stone can be better imitated in glass than this."*

Theophrastus is more explicit on this subject, when

* 'Nat. Hist.' xxxvii. viii. 33.

he plainly says that callais is a fossil ivory spotted with light and dark blue.

All turquoises work smooth. In the East they cut and inlay them with gold.

Many engravings in turquoise are thought to be Greek and Roman works. In the Orleans collection there was a turquoise having an engraving of Diana, and another a portrait of Faustina.

In the Genevosio collection of Turin Caire saw an amulet having on one side the head of Diana, with a veil on the head, and on the other a cittern, a star and a bee. The Florence gallery had a turquoise which was as large as a small billiard ball, and on which was engraved a likeness of Tiberius.

Nevertheless, I think, with King, that there is much reason to doubt the antiquity of these works. For my part, I have never seen engravings on turquoise that were anterior to the twelfth century A.D. But there have been precious ornaments, both Tyrrhenian, Etruscan, Grecian, and Roman, in which I have seen this stone used.

XCVIII.

VARIOLITE.

This stone is a dark-green felspar, with grey marks or black spots encircled with white.

It is opaque, very dense, very heavy, and emits sparks under steel. It is broken and worked on the

wheel with difficulty. It takes a very good polish, especially on the spotted parts, as being hardest.

This felspar came originally from India. Now it is brought from the Alps, where it is found in pieces of immense size.

The appearance of this stone, which has a certain resemblance to the human skin marked by small-pox, created the belief, in times of ignorance, that it had the power of curing that infirmity, for which reason it received the name of variolite.

However, it is not always green—there are some white, red, and blue. The marks also vary in colour. There are some which, besides the black spot encircled with white, have a second circle of a lighter colour like the onyx.

I have never seen antique engravings on variolite, although, on account of the substance of which they are composed, it would be very easy to engrave on it, especially animals of the feline race.

XCIX.

VERMILION.

This stone is divided, like other gems, into Oriental and Western.

The Oriental vermilion is of a crimson red, slightly tinged with orange. It is a clear corundum, having a specific weight of 4·2. It is almost as hard as the ruby or the sapphire. I do not know how it was

formerly, but at present it is scarce beyond everything. Some have even expressed a doubt as to whether it really exists.

Western vermilion is a garnet of a crimson-red colour, inclining somewhat to yellow, and not to black and violet, like other garnets, from which it is distinguished by these qualities.

It is very common; but principally in Germany, as elsewhere, it is only found in small pieces.

It has been a question among mineralogists if vermilion is distinct from the garnet, or to be considered simply a variety of it; nevertheless, goldsmiths, lapidaries, and jewellers easily recognize it, and know that Oriental vermilion is a corundum of great value, and the Western stone differs from garnet, as it is said, in colour, and also in being clearer.

C.

SAPPHIRE.

In vain have I sought amongst writers for the etymology of this word, which was given originally, not to a single gem, but to all stones of a beautiful blue colour.

I found that this gem, like the emerald, has almost an identical sound in various languages. Thus in Greek it is called *Zapphiros;* in Latin, *Sapphirus;* in Hebrew, *Sapphir;* in Chaldaic, *Sapirinon;* in Syriac, *Saphilo;* and in Samaritan, *Saha.*

The sapphire is also divided into two kinds, viz., Eastern and Western.

The Oriental sapphire is a clear corundum, which has all the gradations of blue. It is found only in India, and especially in Ceylon.

In hardness it is equal, if not inferior, to that of the red corundum.

Its crystals, like those of other corundums, have the primitive form of a dodecahedron with triangular faces, but most frequently they are rounded.

Its specific gravity is 4·01. It possesses double refraction in such a degree as to surpass every other stone, not excepting the diamond.

It takes its place amongst the translucent and transparent gems, and often its imperfect crystallization gives it a milky opacity.

Like the ruby, it is composed of alumina almost pure; its colorization being due to oxide of iron. It is remarkable how the same metallic oxide produces two such different colours in the same stone; and, whilst remembering that the ruby darkens at the fire, and the sapphire tends to becoming colourless, we must attribute this diversity to the greater or less oxidation experienced by the metal at different degrees of heat.

The Oriental sapphire, to be considered beautiful, must have a clear blue colour, not too light, and of perfect limpidity.

It thus appears soft as velvet, and is so charming that it justifies the simile used by Dante to indicate the clearness and vivacity of the air :

"Dolce color d'oriental zaffiro,
Che s' accogliena nel sereno aspetto
Dell' aer pur, infino al primo giro,
Agli occhi miei rincominciò diletto."

Purg. 1.*

The blue corundum is, however, often defective, having milky spots, white lines, flaws, or nodules, all which must diminish its value.

Some of these become more beautiful if exposed to a strong reflected heat in a crucible full of cinders and clay.

The celebrated English chemist Brewster, having perceived the great refracting power of the blue corundum, recommended and used it beneficially for microscopic lenses.

The price of sapphire is variable. Feuchtwanger gives the following table:

	Lire.
1 carat	10
2 „	20
3 „	30
4 „	45
5 „	60
6 „	80
8 „	100
10 „	200

* "Sweet colour of the oriental sapphire,
That was upgathered in the cloudless aspect
Of the pure air, as far as the first circle,
Unto mine eyes did recommence delight."

Longfellow's trans.

The Western sapphire is a blue quartz, but it is found of very varied tints, as some stones of this kind are of a greenish blue; many of a dark blue somewhat inclined to amethyst; others almost all white, but slightly bluish.

They receive different names. Thus, French and leaden sapphires are called water sapphires; but all the stones called Western sapphires are not really such. And I remember that Count Lavinio Spada stated that he had never seen a clear blue quartz, because all the stones that had been shown him under that denomination, if really clear, ought rather to have been known as dicroites.

The Western sapphire is more frequently dark, and it always has a resinous light. In general its specific weight is 2·580, and its hardness equals that of other quartz. It loses colour under the action of fire.

Bluish quartz is found in Silesia, Bohemia, Alsatia, and France, but it also comes from the East, and especially from Ceylon. For ages it has been known that France produces Western sapphires, and even in 1753 a countryman of the village of Expailly obtained a precarious livelihood by seeking these gems in the neighbouring brook called Riouppezzouliou.

There has been much discussion as to what the ancients understood by the name of sapphire.

Aristotle and Theophrastus described the zapphiros as a blue gem, covered with spots and veins of gold.

Pliny, by the word sapphirus, similarly describes a gem "which shines with gold spots. Sapphires are blue,

and very seldom purple. The best are found in Media, but nowhere are they found transparent. Besides this, they are difficult to be worked and useless for the engraver, as they contain certain crystalline spots."

Isidore, however, remarks that the "*sapphirus cœruleus est cum purpura habens pulveres aureos sparsos.*"

May not this be the lapis-lazuli?

Some modern authors believe the modern sapphire to be the ancient *cyanos*, of which Pliny writes: "Turquoise stone of a blue colour. . . . The best are found in Scythia; the next best in Cyprus, and after them, in Egypt. They are generally imitated by means of a certain tincture, and the discovery of this is attributed to a king of Egypt. This stone is also divided into masculine and feminine. It sometimes contains dust of gold, not like that of the sapphire."

It is generally believed that this substance is the sulphate of copper, which, in its native state, is almost transparent, and of considerable hardness; this opinion agrees with the description given by Theophrastus* of the *cyanos*, in which it is clearly seen that the Egyptian imitation of the cyanos is the paste or blue vitrification which is found in almost all ancient Egyptian ornaments, and still made by modern Egyptian workmen, and called *zaffre*.

But, on the other hand, let us remember what Solino has written:

"Amongst the Ethiopian things of which we have spoken, the hyacinthus is of a bright bluish colour;

* Chap. 55.

this stone is highly prized when found without spots, being very subject to defects, so that it is often diminished in value by having a violet tint, clouded with a black shadow, or deadened by a wax tint which whitens it too much."

"The best colour for this stone is clear, neither too much dulled by a dark tint, nor too light by excessive transparence, but inclining to a medium colour between blue and purple. This is the gem which is sensitive to the air and sympathises with the heavens, and which does not shine equally whether the firmament is dark or light. Besides this, when put in the mouth, it is colder to the taste than other gems. As to being engraved, it is not very suitable, because not easily cut (attritum respuat): nevertheless, it is not altogether invincible, as it may be cut and engraved in different forms (scribitur et figuratur) by the diamond."

From all these descriptions, it appears certain to me that the ancients applied the term *sapphirus* to some blue stone, like that which we now call *zappherine*. Besides, they denoted specially under the name of *sapphirus* that particular stone called by us *lapis-lazuli*. And that, finally, they gave the name of *hyacinthus*, without any doubt, to that precious substance now called by us *corundum*, because in its various forms it is like the different colours of the flower into which Hyacinth, the young friend of Apollo, was changed. And therefore they called the ruby corundum *hyacinthus purpureus*, and the blue corundum *hyacinthus sapphireus*.

The ancients attributed magical power to the sapphire, and said that it kept away sickness and evil thoughts, whence the ancient distich:

> "Corporis ardorem refrigerat interiorem
> Sapphirus et Cipriæ languida vota facit."

It was said to be so inimical to poisons, that when placed in a glass vessel with an asp or any other venomous animal, immediately the animal perished.

King says he read in 'San Girolamo' that the sapphire procures the favour of princes, pacifies enemies, delivers from enchantments, and gains long-desired liberty for the slave.

Galen and Dioscorides speak of the medical properties of the sapphire, and consider it an active remedy against fevers.

The sapphire was sacred to Apollo, and worn on the back when consulting his oracles.

Boezio asserts that this gem preserved chastity, for which reason it was much used by the priests.

At present the sapphire is the gem set in the state ring which the cardinals receive in taking the purple.

Many beautiful Oriental sapphires furnish the caskets of the sovereigns of every country, for the blue corundum is less rare than the ruby.

In Europe, one of the most celebrated is now in the Paris Museum; it was found in Bengal by a poor wood-cutter; it belonged to the bankers Ruspoli, of Rome, from whom it passed to Germany, where a Frenchman,

named Perret, bought it for 170,000 lire; it weighs about 132 carats.

There are many very large sapphires in the Russian treasury. In the French treasury there are 160 that are valued at 600,000 lire. At Dresden, in the green vaults, there were many of remarkable beauty. In the Viennese Kronenschätze is one which is wonderfully large and fine.

According to Emanuel, an English gentleman had one, perhaps the finest ever seen, but he sold it, and substituted a false one in the precious ornament which had contained it. This was so like the real one, that the appraiser of the jewels left by him at his death estimated it at 2,500,000 lire, and made the heirs pay legacy duty on it.

It is said that the King of Aracan had one as large as a thumb.

Most beautiful is that sapphire which belongs to the Borghese of Rome, for which, not many years since, was offered 20,000 gold zechins, or about 235,000 lire.

Some authors assert that the sapphire cuts better than the ruby, because it is more easily broken.

We find corundums engraved by the ancients, and at the present day they are still engraved. I have however never had the opportunity of seeing blue quartz, that is, Western sapphires, having antique engravings.

In the Genevosio collection of Turin there was a white sapphire which had the head of Tiberias engraved on it. In the Strozzi collection was one with the profile of Hercules. In that of Paris they have a

fine sapphire on which is engraved the emperor Pertinax. It is said there is in the Petersburg Museum a sapphire whose colour varies from whitish to clear blue, and on it is engraved a draped head; so that the face is white and the folds blue, which produces a beautiful effect. I have a sapphire on which is the head of Vespasian in relievo; it was found in the Appian Way. It was copied on a blue quartz by the gifted Odelli, a skilful Roman engraver, whose work, in my judgment, succeeded excellently; but the artist assured me that the quartz cuts very badly on account of the want of closeness in the material. The same artist engraved for me two large blue corundums, and on them he succeeded in giving his work a beautiful finish, because, being harder, they offered more resistance to the tool.

EPILOGUE.

After having carefully considered the different gems, and with as much minuteness as I have found possible, it seems to me that it will be useful to collect under the classes, genera and species to which they belong all the substances mentioned in our catalogue, the greater part of which are called precious stones.

Let us remember, then, that all the mineral constituents of our globe are divided into three great classes, viz.:

1. Minerals—combustible.
2. Minerals—metallic, or metals.
3. Minerals—lithoid, or stones.

Amongst gems, the diamond belongs to the first class, that is, the combustibles, and must be considered a variety of carbon properly so called, under the genus of carbonates. With this are comprehended the carbon, or opaque black diamond, and the boort, or knotted diamond.

Of the second class, that is, of metals, it does not fall within my province to speak, because, although gold, silver, platina, and other similar metals, are commonly used ornamentally, and are called precious metals, we have excluded them from our treatise, because they must not in any degree be identified with gems, and neither could we speak of them with-

out a lengthened dissertation on the goldsmith's art, which would have caused us to deviate from the principal subject. Besides, this subject has already been treated by me in a short work entitled *Dell' Oreficeria antica*, and perhaps will be again considered in a more voluminous work.

The genera of the third class, to which belong almost all the substances called gems, are, as stated in the introduction, twenty-four; but we need not name them all, those being sufficient which include every substance partaking of the nature and name of precious stones.

All gems, then, are arranged under the following genera and orders of the third mineralogical class:

The 1st. Non-metallic oxides.
6th. Aluminates.
7th. Aluminous silicates.
8th. Non-aluminous silicates.
9th. Silicates mixed with other components.

To the first genus, of non-metallic oxides, belong the species—

1st. Of corundum, some of whose varieties are:

1. The oriental ruby.
2. The oriental sapphire.
3. The oriental aquamarine.
4. The oriental alabandine.
5. The oriental amethyst.
6. The oriental emerald.
7. The oriental topaz.
8. The adamantine spar.
9. Emery.
10. The oriental jacinth.

2nd. Of the silicates or quartz, amongst whose varieties are:

1. The agate.
2. The chalcedonyx.
3. The carnelian.
4. The calcedony.
5. The cacholong.
6. The jaspar.
7. The rock crystal.
8. The chrysoprase.
9. The aventurine.
10. The girasol.
11. The iris.
12. The hydrophane.
13. The amethyst.
14. The quartz aqua-marine.
15. The almandine.
16. The xyloidina.
17. The niccolo.
18. The onyx.
19. The cat's eye.
20. The opal.
21. The plasma.
22. The sard.
23. The sard-agate.
24. The sardonyx.

To the sixth genus, that is, of the aluminates, belong the species—

1st. Of the aluminate of magnesia, amongst whose varieties the principal are:

1. The spinel. | 2. The balais.

2nd. Of aluminate of glucine, amongst whose varieties are:

1. The chrysoberyl. | 2. The cymophane.

3rd. Of the aluminate of copper, amongst whose varieties is reckoned:

The turquoise.

To the seventh genus of aluminous silicates belong the species—

1st. Of the composite aluminous silicates, amongst whose varieties are:

1. The calcareous garnet.
2. The magnesian garnet.
3. The ferruginous garnet.
4. The manganese garnet.
5. The chrome garnet.
6. The ovarite.
7. The vermilion.

2nd. Of the aluminous silicate of magnesia: some of its varieties are:

1. The dicroite.
2. The hypersthenum.

3rd. Of the aluminous silicate of glucine: some of its varieties are:

1. The beryl.
2. The emerald.
3. The aquamarine of Ceylon.
4. The prasina.

4th. Of the aluminous silicate of soda: one of its varieties is:

Natrolite.

5th. Of the aluminous silicate of lime or of magnesia: amongst its varieties are:

1. The idocrasium.
2. The pyroxenum.
3. The schists.
4. The touchstone.
5. The epidote.

6th. Of the aluminous silicate of lithia, of magnesia or lime: amongst its varieties are:

1. Mica.
2. Lepidolite.

7th. Of felspars: amongst its varieties are:

1. The adularia.
2. The amazzonite.
3. The argentina.
4. The argirite.
5. The axinite.
6. The cyanite.
7. The clorophane.
8. The labrador.
9. The variolite.
10. The porphyry.

To the eighth genus of non-aluminous silicates belong the species—

1st. Of the silicate of zirconia: amongst its varieties are:

1. The jacinth.
2. The jargoon.
3. The essonite.

2nd. Of the silicate of magnesia: amongst its varieties are:

1. The chrysolite.
2. The olivina.
3. The peridot.
4. The spuma mariña, or sea froth.

To the ninth genus of united silicates and other composites belong the species—

1st. Of the fluoriferous silicates: amongst its varieties is found:

The topaz.

2nd. Of the sulphuric silicate: amongst its varieties are found:

1. The lapis-lazuli.
2. The lazulite.

3rd. Of the silicate of lime and potash: amongst its varieties is found:

The hauyna.

4th. Of the silicate of borax, magnesia, alumina, &c.: amongst their varieties are:

1. The tourmaline. | 2. The rubellite.

To the eleventh genus of different carbonates belong the species—

1st. Of carbonate of lime: amongst its varieties are:

1. Marble.
2. Alabaster.
3. Stalactite.
4. Alabastrite.
5. Lumachella.
6. Oolite.
7. Pisolite.

2nd. Of carbonate of copper. The principal amongst its varieties is:

Malachite.

To the fourteenth genus of phosphates belongs—

Carboniferous phosphate of lime, and amongst its varieties is found:

The phosphoric turquoise.

To the eighteenth genus of sulphates belongs—

The sulphate of iron: amongst its varieties are:

1. The marquisite. | 2. The hematite.

Besides the mineralogical classes under which we have arranged the greater part of these gems, there remain some which belong more properly to the vegetable or animal kingdom.

Of these I do not give a scientific classification. In the first place, because they are few; and in the second place, because doing so would lead me into a special treatise foreign to the present subject, and which belongs more to the province of botanists and zoologists.

On this matter it is sufficient for me to say that the precious substances named in this book which, belonging to the vegetable kingdom, are used ornamentally, are:

1. Amber.
2. Gagat.

And to the animal kingdom:

1. Ivory.
2. Shells.
3. Coral.
4. Mother-of-pearl.
5. Pearl.

I have besides mentioned in my list mosaics, pastes, and enamels of various colours. These, being productions of art and not of nature, are not included in any class or genus, although mentioned in this treatise because they serve the same purpose as gems.

With these observations I conclude my work, sufficiently rewarded if, by this effort, I shall in some degree have been an assistance both to those who study precious stones as naturalists, and to those who make it a subject of art and of commerce.

I do not pretend in this work to teach anything new, or to have made wonderful discoveries, but only to have given a book on gems, in which is collected the best observations hitherto made in works on similar subjects; my object having always been, both in my work as a goldsmith and by my pen, to promote, in Italy, the further increase and greater glory of the art which I profess.

Vale.

16*th October*, 1869.

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